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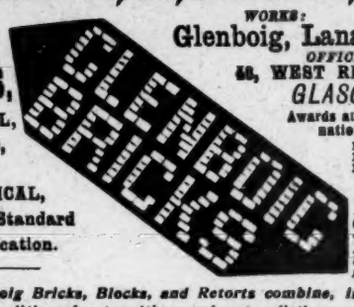

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EDITORIAL NOTES.

Financial Relief.

IT is quite certain now that some of the gas companies who will be in Parliament next session asking for relief in respect of their heavily depreciated dividends, due to the operation of war costs and the sliding-scale, will be suggesting an alteration in the standard price in preference to adopting the proposal of the National Gas Council, that share and stock holders shall be allowed 80 p.ct. of the difference between the pre-war dividend and the amount of the dividend payable at the present time under the terms of the sliding-scale. It is submitted by those who favour the standard price plan that the Council's scheme will not adequately fit all applicants, and that an increase of the standard price to an extent befitting the circumstances of each undertaking would be more appropriate. This is a matter (in view of the change being temporary) for argument and demonstration—at any rate, the chief executive officer of the various companies concerned can work out the matter for himself, and see whether or not one plan would, in the particular circumstances of his company, be more preferable than the other. There are, however, considerations attaching to the scheme of the Council that may, perhaps, commend themselves to a Parliamentary Committee. One is its simplicity; another is the fact that it does not propose that the share or stock holder shall not sacrifice something in respect of war costs; and, further, it will obviate any temporary interference with the standard price until the terms of the sliding-scale are discussed at some future time with a view to the readjustment that must be made in consequence of the change in basic economic conditions that had started prior to the war, and have been so considerably accentuated since, in respect of finance, costs, and labour. Higher costs for labour and material, there is no question, are going to be permanent, and higher taxation and much dearer money than before the war are inevitable for years to which no one can put a number.

However, the permanent revision of terms is a question for the future; and it really matters little whether now, for temporary purposes, the Companies approach Parliament with more than one method of arriving at relief, if a good case can be shown for differential treatment. The duplicating or the triplicating of method is quite secondary in importance to a united front in asking Parliament to redress an injustice to gas capital due wholly to the burdens imposed by the war; and this united front is in existence. As we have already seen, the London County Council are likely to lodge petitions against certain of the Bills, while a number of local authorities—mostly owning electricity supply undertakings—who have banded themselves together to oppose the schemes of the gas industry on the ground of protecting the interests of the communities they serve, are evidently (judging from their attitude before they have had the opportunity of learning the actual position of the matter) not disinclined to "protect" these interests by committing an injustice. The protection and injustice have strange incongruity. However, in this connection it is very interesting to recall that various gas undertakings in Ireland some time ago approached the Local Government Board for a revision of their maximum prices. What was the upshot in the other cases we do not know, but in that of Lisburn the Board sanctioned an increase from 4s. to 6s. per 1000 c.ft.; and the Unopposed Bills Committee of the House of Commons raised no objection when the Provisional Order ratifying the change was submitted to them. In this and other ways Parliament has recognized the propriety of the revision of statutory terms in respect of war costs. We have seen it in connection with the price of coal—for example, the last 2s. 6d. per ton addition to the standard excess fixed by the Limitation Act. We have seen it from time to time in connection with the revision of controlled prices—sulphuric acid may be mentioned as a case in point. We have seen it in the Courts (Emergency Powers) Act, which, *inter alia*, grants relief in connection with the present war from liabilities and disqualifications arising out of certain contracts. Instances could be multiplied, which show that Parliament has freely adopted the principle of adjustment under the stress of war conditions. Gas capital and the investors in it have been the victims in an unusually heavy degree of these conditions, owing to the inflexibility of controlling legislative enactment.

The Price and the Stockholder.

IF any stronger case than that which pre-existed were required for stopping the steep descent, under the sliding-scale, of dividends on gas capital, it is furnished by the Gas Light and Coke Company, who have the largest issue of ordinary stock of any gas undertaking in the United Kingdom. The Directors have just given notice of another increase of 6d. per 1000 c.ft., which will make the price 3s. 10d. When, during March last, they announced an advance from 3s. to 3s. 4d., they stated that it did not even approach in proportion the extra costs of labour, freights, coal, oil, and every class of material employed in manufacture and distribution. Since then costs have shown no disposition to recede; on the contrary, what with the addition of 2s. 6d. per ton to the price of coal in respect of the increase in miners' wages, with costs in every other direction mounting up, including labour, there is no certainty as to where we are going to meet with the top figure of outgoings per 1000 c.ft. of gas produced. In the matter of costs, we have given up all idea of any stability in them under war conditions. At one time there seemed substantial hope that a state of affairs had been reached at which some approximate computation of costs could be made; but whatever was thought then, the grounds of computation have proved their insecurity, and have warned against the misplacing of faith in them. The conditions that compelled the raising by the Company of the price of gas from 3s. to 3s. 4d. in March last were bad, but they are much worse now; and the holders of the ordinary stock—unless Parliament comes to the rescue, and says that it is a fair thing that the consumers should pay a price that includes a reasonable dividend upon the capital employed to supply them—will be reduced to receiving a dividend at the rate of about 3 p.ct. per annum, less the heavy income-tax.

No fair-minded person can submit that this is just; for it shows how thoroughly the sliding-scale has broken down in maintaining, under the strain of war circumstances, a fair balance as between the interests of the consumers and the providers of the capital which enables the supply of gas to be made. Anyway, even if Parliament exercises its power to do justice to gas capital, the stockholders of the Company cannot, so far as we can see, escape at all events one half-year's dividend at the lower figure, unless some special provision be made to meet it. For the last half year, stockholders received a dividend at the rate of only £3 14s. 8d. p.ct. per annum, less income-tax, with the 3s. 4d. price then ruling; and the same dividend we suppose will be declared for the current half year. When the price of gas was 3s. per 1000 c.ft., stockholders only received £4 4s. p.ct. per annum. less income tax; while at the time war broke out, with the price at 2s. 6d., they were receiving £4 17s. 4d.

p.ct. per annum, less what we in these days would regard as quite a moderate income-tax. So that, even at the price charged to-day, since the war started the stockholders have dropped £1 2s. 8d. p.ct., and from the balance of £3 14s. 8d. there has to be deducted the weighty income-tax. With the price at 3s. 10d., the loss of dividend, compared with June 30, 1914, will, we calculate, be £1 17s. 4d. p.ct. per annum; and the balance of £3 will be subject to the heavy income-tax. Every business man must confess that there is something wrong in this condition, and that the argument of the inviolability of the peace time sliding-scale terms must be included in the huge mass of wreckage produced by the war.

Labour and Cheaper Coal.

IN these days when many men's minds are concentrating (so far as the war will allow) on the question of industrial reconstruction and trade after the war, a paper such as that which Prof. Henry Louis, the President of the Society of Chemical Industry, read last week before the London Section, on the "Economics of Coal Production," and the thoughtful comments upon certain aspects of the subject by Mr. Charles Carpenter, D.Sc., are particularly appropriate, and should have considerable effect in drawing attention to a matter of nationally great fundamental importance. Coal has been ascending in price over a long course of years; the movement has not, as some seem to think, been confined to war years. The war years have only emphasized the fact of ascent by accelerating the rate of cumulative movement; and we know very well that with the end of the war there is not going to be any *pari passu* recession. Prof. Louis points to the serious position in which Great Britain will find herself, unless heed be given to the increasing cost of coal. A cheap and plentiful supply of coal is a fundamental necessity to maintaining, let alone enlarging, our holding in the industrial and commercial spheres of the world; and seeing that other coal-producing nations—this country's chief competitors in these spheres—provide a cheaper coal supply for home use than does this country, we start with a disadvantage of considerable weight and difficulty. We admit that during the war we owe not a little to the Price of Coal (Limitation) Act in preventing coal prices soaring to a level that would have been ruinous—more especially as miners' wages have been, with a gross negligence of economic considerations, based upon the price of coal rather than, as Prof. Louis contends they should be (and no sane man would hold the contrary view), upon output. But even with the price-curtailing influence of the Act, the cost of coal delivered has been at an amount that has had a very grave result on the expense of materials required by the war, as well as on the commodities—gas among the rest—necessary to the life of the community. If the future of this question of the need for cheap coal is regarded in the light of the current position as affected by dear coal, the gravity of which Prof. Louis has spoken will need no greater emphasis.

All this is conceded. But the important question is how, and in what direction, can coal be cheapened? All the evidence supplied in the paper points to the fact that labour is the dominating factor—the factor standing between the nation's larger prosperity and a cheaper supply of coal. A very few words will cause this to be accepted. Wages represent two-thirds of the value of coal at the pit's mouth—the exact percentage being 62·55; and hewing coal forms no less than one-third of the cost. These facts alone show that the charge for labour is the one that offers most scope for reduction; but it happens likewise to be the one that presents to those who would attack the problem the most concrete difficulties. It is obvious that the balance of 37·45 p.ct., including materials, administration, upkeep, royalties, and dividends, does not on the whole admit of any great impression being made therethrough upon costs. But still the 37·45 p.ct. may be capable of economies which, taking the entire industry, would not be a negligible amount, inasmuch as we are dealing with a large industry and large totals, and not something that has insignificant magnitude. The taking of an average percentage, too, does not present all the facts with exactitude. For example, Prof. Louis submits that colliery owners' profits and coal owners' royalties do not leave much margin for reduction. The average percentage is one thing; a study of the dividends paid by some collieries of immense outputs and considerable capitals suggests that there are colliery owners who are making more substantial dividends out of providing coal than are the industrial users of the coal. However, it is not likely that the rate of wages will decrease; and there only seems to be one means by which any impression can be made upon the labour costs attaching to coal, and that is by increasing the output per man by one or all of three ways—educating the miners to a greater sense of responsibility and duty, changing the basis of increase of wages from coal prices to coal output, and using a much larger number of mechanical cutting-machines.

What possible chance is there of educating the miner to a better sense of duty? He has tasted the sweets of higher wages; and the result has been that he has preferred to have more leisure, the higher wages enabling this without sacrificing weekly income. What possible chance is there, too, when the miners' own trade unions preach the gospel of reduced output per man providing more employment for the working class, while hiding the truth that increased output means increased national prosperity, and more work for all. We do not think, as Mr. Carpenter appears to do, that the miners have any fear, or entertain any dread of unemployment; the mode in which they prosecute their demands does not support such an idea. But we agree with him that one cannot entirely blame them or labour generally for want of recognition of responsibility. The fact that the miners can swallow and act upon such a pernicious economic doctrine as the one just referred to shows positively that there are others who have been neglecting their responsibilities, and those responsibilities begin, as Mr. Carpenter puts it, with the teaching of the young with the view to bringing them up as good citizens. When (if ever) the miners understand that high wages are a small matter if they will give fair value for the money, we shall have got to the real root of the difficulty. But they will not now care to understand it. They are hardened to other ways and to other thoughts, which include certain misconceptions. In all reconstruction schemes, let the conviction of neglected educational responsibility in the past be wiped away by careful attention to that responsibility in the future—the responsibility of beginning to educate in the right manner and at the right time. A stimulus to this is found in the serious remarks of the same speaker, that we shall lose our future unless we can change the attitude of labour.

In dealing with the present miners, a change of policy would probably be more efficacious than anything else—a change of policy that would place increase of wages upon output and remove it from coal prices. There is also much room for the augmented use of cutting-machines. The output per man in America is greater than the output per man in this country. Scientific management, working on bonus systems, the thicker seams of coal are all contributors to the greater output per man in America than here; but the larger employment, too, of cutting-machines has an immense effect. Out of our total output of 256,375,366 tons of coal in 1916, only 26,805,398 tons were the product of mechanical cutting.

The whole question goes so deeply down to the roots of the economic position of this country and of every industry, that the more attention is paid to the subject which Prof. Louis brought to notice, the better; for an extended appreciation of its importance is a condition precedent to change.

Electricity Undertakings and Gas and Bye-Products Manufacture.

WE see that the Gloucester Electric Power Company and the Shropshire, Worcestershire, and Staffordshire Electric Power Company are proposing to promote Bills in Parliament referring to the acquisition of lands and the construction of generating stations, together with authority to manufacture "gas and residual products." The London Electric Supply Company, Ltd., are also asking for an extension of time for the purchase of land at Barking already authorized to be taken as a generating station, and the manufacture of "residual products, bye-products, &c." In the last-named case, the "bye-products" project appears to be a continuation of parliamentary authority formerly received; but in the case of the two power companies, the part of their schemes as to the manufacture of gas and residual products is obviously something new. These companies apparently cannot wait until the Board of Fuel Research have investigated the question as to the feasibility of combining a plant for coal carbonizing and making gas and bye-products with an electricity generating plant; but they prefer to go to Parliament, and submit their proposals to a tribunal not so competent technically to investigate the matter as are the members

of the Board of Fuel Research. The Gloucestershire Power Company, although granted generating and supply powers originally in 1902, have not yet commenced operations; but the Shropshire Company, who were given their powers a year later, are actively at work. However, we do not see that the latter Company previously contemplated the carbonization of coal and the manufacture of gas and bye-products.

No ordinary Parliamentary Committee, we suggest, can properly decide as to the wisdom or otherwise of allowing these particular powers. Nothing in connection with the proposal has been thoroughly investigated. Even the electrical experts who hold the belief that there is in the plan economy for electricity supply undertakings have the belief founded on nothing better than hypothesis. In their last report, the Board of Fuel Research described as "plausible" the statements that have been made showing the enormous profits and savings that would accrue if schemes of this sort were adopted by the electricity supply industry; and they declared that the statements have generally been made on a very slender foundation of knowledge and experience. At the same time, there is agreement on the part of those best qualified by practice and experience to judge, that the interests at stake are so great that the question ought to be authoritatively answered once for all. But is a Parliamentary Committee a tribunal who can give the answer? Obviously, if the Board of Fuel Research are not in the position to settle the matter without complete research, a Parliamentary Committee cannot be. And the Board have said that no answer can be accepted which is not founded on the complete working out of the scheme—no important step in the series of operations being omitted or slurred over. Capital charges have to be considered in addition to working charges and the quantities and market values of the products; and it becomes a question whether the plants needed for meeting maximum electricity requirements could supply heat or steam on the same economical basis as a plant already established—such as a gas-works plant—with a greater diversity of demand upon it, and a larger load. It is possible Parliament will suggest that electricity undertakings had better wait for the results of some systematic and thorough research before taking a leap in the dark. There would unquestionably be prudence in such an attitude on the part of Parliament.

Gas-Fired Boilers.

We are not going to say there was not much information in the paper that Mr. T. M. Hunter, M.A., F.C.S., read at the last meeting of the Institution of Electrical Engineers that will be useful to members in considering the question of the application of gas from various sources for the firing of boilers. But the paper was decidedly overdone; and it was not a compliment to the intelligence and knowledge of members of the Institution that so much elementary matter should have been embodied in it. We are giving a comparatively small part of the communication. Even in this section, the author informs the members as to what happens when gas and air are indiscriminately sent into boiler furnaces—a matter so obvious as to have needed no telling to any audience composed of technical men. He also described the action of a bunsen burner in respect of the induction of air supply, and stated that there should be a minimum volume of flue gases carrying away heat to the chimney. He also told the members of the effect of low gas pressures when used in bunsen burners. Was all this padding necessary for the information of electrical engineers, the economy of whose stations depends so much on the efficiency of their steam-raising plants? Mr. Hunter, however, has no doubt that gas-fired boilers, if applied scientifically, have now a greater future than ever. Brief allusion was made by him to the Bonecourt boiler. While confessing he has had no practical experience of it, there appears to be in his remarks a trace of scepticism regarding it.

Gas or Coke for Steam-Raising.

The discussion on the paper showed very distinctly that the leaning of electrical engineers is in the direction of utilizing gas under boilers for raising steam for driving turbo-generators, which coincides with the view of Captain H. Riall Sankey, as seen in the "Thomas Hawksley" lecture, reported last week But the question is, What kind of gas? There is gas and gas. There is gas rich in combustibles, perhaps of fairly low calorific power, which nevertheless gives a high flame temperature, and does not require so much air to obtain complete combustion as a higher calorific value gas. There is gas, too, that already has a heavy percentage of nitrogen in its constitution, and is therefore bad for high-temperature working. The question of the most suitable gas has to be first decided, in order that determination may be made as to the plant to adopt. Mr. E. W. L. Nicol showed himself as opposed to the use of gas for boiler firing, and for a reason which suggests the necessity of a very complete investigation of the relative advantage of gasifying coke with ammonia recovery, and utilizing direct under steam-boilers the incandescent coke as drawn from gas-retorts, a considerable quantity of sensible heat being at present wasted by the quenching of the coke. Whether the utilization of this heat would compensate for the loss of the ammonia when converting the coke into gas is a question that must be determined in the light of future developments, because the probability is that sulphate of ammonia is not always, with the march of fertilizer production, going to command even the controlled prices of to-day. Moreover, conversion of the coke is not to be done for nothing. There are capital and other costs; the expense of the steam; and the loss of heat as between the gas B.Th.U. and the coke B.Th.U.

Other Points.

Mr. Nicol's humorous reference to a "twopenny tube" being requisite for the conveyance of the required quantity of gas to the boilers depends on the gas itself. He was speaking of gas of 130 B.Th.U.; from coke we should get a gas of 300 B.Th.U., which would make a vast difference in the size of the "twopenny tube." On the whole, however, there appears to be among men of position in the electrical industry a feeling that in the supply of gas derived from the gasification of coke—if this be the better plan than the one advocated by Mr. Nicol—there is the possibility of closer working relations between the gas and electricity industries. This is particularly seen in the remarks of Mr. C. P. Sparks and Mr. J. B. Paton. On the other hand, Mr. W. H. Patchell looks upon coke as a bad fuel for steam-raising purposes, on account of the large amount of ash it contains. His experience must have been bad; but perhaps it is only wartime experience. The ash necessarily depends on the amount contained in the coal; and just now the quantity in coal is a monstrous matter. Other electrical engineers have testified to excellent experience from the use of coke. The problem of the fuel supply to electricity stations is clearly in a very interesting position; but it is no use talking around the subject. It merits complete investigation, and by men qualified to make it, and not by men (however great their qualifications in other directions) who have had no experience in coal carbonization, have little chemical knowledge, and whose efforts in research in this direction—there are instances within knowledge—have among practical men been mirth-provoking.

The Gas Traction Committee.

The contributor to the "Westminster Gazette" on "Motors and Motoring" subjects, who signs himself "J. O." is not particularly enamoured of the appointment of a Gas Traction Committee, nor of the use of gas as a motor fuel. He shrugs his shoulders over both, though admitting that the Committee is powerfully constituted. While grudgingly agreeing that coal gas has come in handily in the present petrol situation, he takes it for granted that it has no particular virtues for this purpose, and is not disposed to give it a chance. He does not like the flabby gas containers. Nor does anyone else; but they have been and are very useful in a serious emergency, and would not have been adopted had they not been so. Steel cylinders for compressed gas he regards as too heavy for motor purposes; but apparently he has never heard of lighter cylinders being produced. "J. O." also libels gas by describing it as a purely alien fuel, while it is an all-British product. Furthermore, he sees no reason why gas should be thrust upon motor users by a mere handful of coal gas advocates as a permanent fuel after the war. Now whatever are the wrongs of the ways of gas men, they have never suggested that individual liberty should be sacrificed for their advantage. However, the critic does not think the Committee can come to any conclusions other than those already known. But the secret as to his doubts and fears comes out towards the end of his criticism. He is electrical to the backbone; and he thinks that battery vehicle makers should have a chance, by the weight of petrol driven machines being restricted. This is extraordinarily magnanimous. "J. O." would supplant economy by uneconomy.

Labour in Coal Mines.

In consequence of Sir Richard Redmayne, K.C.B., having been appointed Chief Adviser to the Controller of Coal Mines. the different parts of the annual general report on mines and Quarries for the year ended Dec. 31, 1916, are being submitted by Mr. W. Walker, in his capacity as Acting Chief Inspector of Mines. The second part, reduced to the smallest possible compass compatible with the importance of the matters dealt with, has just made its appearance, under difficulties; and it shows that the total number of persons ordinarily employed at mines and quarries in the United Kingdom and the Isle of Man during the year was 1,065,714. This was a net increase of 30,114 as compared with 1915. Fortunately, the year 1916 was marked by the absence of any great colliery disaster. The death-rate from accidents per 1000 persons at all mines, on the surface and underground, was 1·313 last year, and 1·354 for 1915; the death-rate per million tons of mineral raised (which provides a more satisfactory basis of comparison) being at the mines under the Coal Mines Act, during 1916, 4·92, as against an average figure of 4·93 for the decennial period 1906-15. At the experimental station at Eskmeals, large-scale experiments in the explosion galleries were during the past year limited in number, owing to shortage of labour; and, in particular, it was found inadvisable to attempt to carry out any of the programme of experiments relative to coal-dust explosions. In the laboratory, however, several lines of research were followed; these including the composition of coal, more particularly in its relation to spontaneous combustion, and the electrical ignition of gases. Naturally, too, work has been done for Government Departments more directly connected with the war.

PERSONAL.

Mr. WILFRED M. GABBATT, the Manager of the Barrow new branch gas-works at Salthouse, was on Tuesday last married at St. Luke's Church, Barrow, to Miss A. Bailey.

Signaller BERNARD HENRY, R.F.A., who is reported to have been killed in action, was, at the outbreak of the war, on the clerical staff of the Leeds Corporation Gas Department.

The Directors of the Gas Light and Coke Company have appointed Mr. H. E. IBBS, the Accountant, to be Acting Secretary, in succession to Mr. W. Beckford Long, whose untimely death is recorded on this page.

Mr. CHARLES HULME, the Engineer and Manager of the Uxbridge Gas Company, was married last Wednesday, at All Saints' Parish Church, Wigan, to Edith, second daughter of Mr. E. H. Simm and the late Mrs. Simm, of Park View, Wigan.

The Directors of the Ambergate (Derbyshire) Gas Company have appointed Mr. WILLIAM H. HARRIS, of Maltby, near Rotherham, to the position of Works Manager, in succession to Mr. WALTER MASKREY, who has taken the position of Manager of the Matlock Bath Gas-Works.

The Birmingham City Council on Tuesday last appointed Mr. ARTHUR COLLINS Treasurer, at an annual salary of £1200. He had for some years held the office of Deputy Treasurer. Mr. W. H. CLARE, the retiring Treasurer, will remain for a year in an advisory capacity at a salary of £600.

The employees of the Peterhead Corporation Gas Department showed their respect for the Manager, Mr. WILLIAM RITCHIE, when recently, on the occasion of his silver wedding, they sent a deputation to his office to present him, on their behalf, with useful gifts. The deputation conveyed the best wishes of the whole staff, which Mr. Ritchie highly appreciated.

War-Time Uses of Gas.—The instalment of Mr. H. M. Thornton's Society of Arts paper dealing with the national importance of the application of coal gas to industry in war time which appears in the December issue of "A Thousand-and-One Uses for Gas," has reference to welfare work in factories and the industrial canteen. The necessity which now exists for carrying on work continuously, and at high pressure, has brought to the frent the importance of providing proper feeding arrangements for workers; and it is a sure thing that the industrial canteen has "come to stay." The suitability of gas for use in connection therewith has on many occasions been pointed out; and any manager desiring to give an idea to employers of labour of what a gas kitchen arranged for the purpose may look like, can do so by procuring some copies of the publication named from the British Commercial Gas Association. It should be noted that the direct benefits which have been found to accrue from the establishment of factory canteens include a marked improvement in the health of the workers, with consequent less absence and broken time; less tendency to alcoholism; and increased efficiency in output.

OBITUARY.

W. BECKFORD LONG.

IT is with much regret that we have to announce the death, on Monday of last week, at the age of 43, of Mr. W. Beckford Long, the Secretary of the Gas Light and Coke Company, after a sudden attack of peritonitis. The funeral took place at New Barnes Cemetery on Thursday; and a Memorial Service was held at St. Matthew's Church, Great Peter Street, Westminster, which was attended by the Directors and the staff of the Company.

Mr. Beckford Long was a Barrister-at-Law, and had spent practically the whole of his life in the service of the Company, succeeding to the secretaryship about a year ago on the retirement of Mr. Henry Rayner. He was a very able officer, and will be greatly missed by all.

M. EMILE CORNUAULT.

IT is with much regret that we learn of the death of M. Émile Cornuault, on Nov. 26, at his residence in Paris. He was in his 72nd year. For a long period he was one of the leading representatives of the gas industry in France, and had occupied with distinction the principal positions it had to offer. He was an Officer of the Légion d'Honneur, and had been President of the Société Technique de l'Industrie du Gaz, and also of the Syndicat Professional de l'Industrie du Gaz. Further, he had attained the presidential chair of the Société des Ingénieurs Civils de France. His administrative abilities, wide experience, and ripe judgment were fully recognized and appreciated. His attractive powers as a speaker were frequently shown at professional gatherings both in France and in this country. At many banquets of the Société Technique he had to respond for the Past-Presidents; so that, as he humorously expressed it at the memorable meeting of the Société at Nancy in 1907, it had become not so much a habit as a career. He was not only courteous, with the proverbial courtesy of the French, but he was sympathetically considerate and warm in his welcome to English representatives attending the French gas meetings, and to reporters for the "JOURNAL." The consistent kindness is remembered, and personal gratitude is recorded.

M. Cornuault joined the Société Technique in 1874. From 1880 to 1886 he was one of the Secretaries to it. In 1887 he was elected Vice-President; and the following year he became President. In this capacity he took part in the proceedings associated with the Paris Gas Exhibition of 1889. His contributions to the technical proceedings were many; and his papers frequently obtained the awards given annually by the Society. In 1884, his subject related to gas lighting of railway carriages, and he also gave an account of the London Gas Companies. This paper was subsequently revised and reissued in July, 1901, on the occasion of a visit to England of members of the French Society after their annual meeting at Dieppe. In 1894, in collaboration, he described the improvements made in apparatus for using gas for lighting, heating, and power. Much later (in 1912) he wrote on the use of coke-oven gas for town lighting.

His presidential address in 1907 to the French Society of Civil Engineers took the form of an historical account of gas lighting and its developments. It was given fully in the "JOURNAL" at the time. In an "Editorial Note" on Jan. 22, 1907, it was described as "a notable presidential address," and of its author it was said that he "needs no introduction from us, for M. Émile Cornuault, as a French gas engineer and administrator, has achieved a high reputation which long ago crossed the Channel." In this connection, it may be recalled that he was one of the representatives of the Société Technique who visited England in June, 1888, at the invitation of the Gas Institute; and again in 1901, he was the delegate of the Société on their visit to Brighton and London.

M. Cornuault was a Director of the gas and electricity undertaking of Marseilles, also of the Société du Gaz of Paris, and other companies, among which was the London General Omnibus Company. He was also an Honorary Member of the Institution of Gas Engineers.

His son, M. André Cornuault, is the Engineer of an important gas firm in Paris; and to him and other relatives we would express our condolences.

The death is announced as having taken place yesterday, at the age of fifty-nine, of Sir WALTER R. PLUMMER, the Deputy Chairman of the Newcastle-on-Tyne and Gateshead Gas Company. The deceased was Unionist member for Newcastle from 1900 to 1906, and was also a Director of the North-Eastern Railway Company.

We regret to record the death, which occurred at Plumstead on the 23rd ult., of Mr. JAMES HUNTER, who was born at Dalkeith in 1839, and entered the service of the Phœnix Gas Company some time in the "fifties," under his father, at the Greenwich works. In October, 1867, he was appointed Engineer to the Woolwich Consumers' Gas Company, and occupied this position until the end of 1884, when the amalgamation of the Company with the South Metropolitan Company necessitated his retirement. Mr. Hunter leaves a widow, two sons (both on the staff of the South Metropolitan Gas Company), and four daughters.

ELECTRICITY SUPPLY MEMORANDA.

THE Electrical Correspondent of "The Times" detects in the existence of the Departmental Committees whose work in one way or another affects electrical generation and transmission a certificate to the failure of the industry to find its voice and use it with a firm tone of both self-reliance and self-assertion. He also thinks that electrical engineers have been too modest in the past, and that they are partially responsible for the fact that England has not been more completely electrified. In place of modesty, he submits that arrogance would be quite becoming to the electrical industry. The Electrical Correspondent does not see things as we see them. He lives in a business world apart from that in which we move; and, living in intimacy with electrical engineers, he does not appreciate their faults and good qualities in quite the same light as we do. His veiled accusation that they have not been self-reliant and self-assertive is a libel. His insinuation as to electrical engineers having shown too much modesty and insufficient arrogance is not entitled to a place among things that are true. They have shown a copious amount of self-reliance and self-assertiveness, no end of immodesty, and a bulk supply of arrogance in attacking gas as a competitor; and the public has not wanted for misleading and slanderous statements regarding gas supply. Yet England has not been completely electrified; and the gas industry is bigger than ever before. But the Electrical Correspondent wants electrical engineers to be more self-reliant, more self-assertive, more arrogant, and to display less modesty in these times, with a view not to defaming the gas industry (which has in this war proved itself a valuable and an indispensable asset to the country) and attempting, by means that do not come under the head of "cricket," to relieve it of part of its business, but to ascertain whether, while the electrical industry will be busy after the war, it cannot be made busier still, with both internal and external advantage. This can only be done by rightly directed energy.

Asserted Deficient Qualities in Electrical Engineers.

The applications that will be made to Parliament in the ensuing session by electric undertakings are comparatively few, but interesting. We see in them proposals for the manufacture of gas and residual products by electricity suppliers, and gas companies asking for electricity powers. In the latter, there is nothing new; but in the former, there has only been an isolated example, and on a small scale, of anything of the kind being done by electricity suppliers. Before powers in this connection are granted, it would be well perhaps, after the views recently expressed in the report of the Board of Fuel Research, for Parliament to wait for guidance from the investigations that are about to be made by Sir George Beilby and his colleagues. Relating to electricity supply in London, we have an echo of certain proposals made a time ago, in which the County of London Electric Supply Company took a prominent part. They are now proposing to ask Parliament for power to pay interest out of capital, and for an extension of time for the purchase and extended use of lands in Barking, authorized to be taken as a generating-station, in conjunction with which "residual products" were to be manufactured. We rather think this is the scene of certain of the Coalite exploits in trying to discover the correct type of plant for low-temperature carbonization. The Shropshire, Worcestershire, and Staffordshire Electric Power Company have a Bill to authorize new works, and, among other things, to manufacture gas and residual products, and to enlarge their powers in respect of the supply of electrical energy, the laying and maintenance of mains, cables, &c. It will be of interest to gas suppliers in the area to ascertain the nature and purpose of the "mains." The Gloucester Electric Power Company also desire to acquire lands, to construct a generating station, and to carry on business as manufacturers of gas and residual products. The Yorkshire Electric Power Company, who are session after session trying to enlarge their powers, are contemplating new and further provisions as to the supply of energy, and as to the imposition of "obligations upon local authorities, companies, and others obtaining powers in future to take a supply of energy in bulk from the Company." The Company evidently look upon this as a fine opportunity for clothing themselves with a little autocratic power. We remember that on a previous occasion they asked for powers denied to other electricity undertakings. The Rotherham Corporation are seeking authority to purchase and supply gas and electricity in bulk, to purchase coke-oven and crude gas, &c. The proposals of the South Suburban Company, as to entering into business engagements with electricity undertakings regarding the supply of energy or heat or power, are also an interesting indication of possible developments. The Pontypool Gas and Water Company are desirous of acquiring the undertaking of the local electricity company. Extension of their electricity powers is also being sought by the Aldershot Gas, Water, and District Lighting Company. Among Provisional Orders, the Leicester Corporation are contemplating the purchase of lands for a new generating station, which recalls Mr. C. H. Wordingham's proposal for the Corporation Gas-Works being the fuel suppliers under the new scheme which he has recommended the Corporation to carry out.

Interlinking Gas and Electricity.

The electrical industry must not look for any great assistance from the colliery and iron and steel industries in the provision of power or heat for electricity generation. Its professional men who follow closely the trend of developing knowledge are also now aware that low-temperature carbonization is not exactly all that it has been represented to be; and that the Board of Fuel Research from their investigations of the available information are not satisfied that a sufficiently exact case has yet been presented upon which to base any reliable opinion as to its technical and commercial advantages. At best, low-temperature carbonization can have but a limited field. It will not pay to carbonize anything but the coals that will yield the best results in oils; and these coals are the most expensive ones. Already, too, it is seen that the promoters of the processes are talking of gasifying the coke and recovering the ammonia that lurks within it, which shows that they are not sanguine of being able to compete with coal and gas and a cheaper gas-works coke for domestic purposes, even though their product has still within it some 10 p.ct. or so of volatile matter, which has been lost for other purposes. If gasifying the coke and recovering the ammonia is necessary to the commercial success of the low-temperature process, then there is already available the coke from gas-works for gasification and ammonia recovery; the gas having a value of 300 B.Th.U. per c.ft. So that, as far as the industries outside electricity supply is concerned, the only safe and permanently established one on which the electricity industry will be able to rely is the gas industry. In view of what has been done on the North-East Coast in the matter of linking-up electricity generation for public supply with the so-called waste heat from the iron and steel industry, it is very interesting to learn that the latter industry appears to be taking stock of its own position, and finding that there is fuel economy to be gained by the co-ordination of its processes and the utilization of its own heat. If this is done, there will be nothing left for disposal outside. This is seen from a paper that Mr. A. H. Marshall recently read before the Newcastle Section of the Institution of Electrical Engineers. The case he made out was in rough that, with a works laid out complete with coke-ovens, blast-furnaces, steel furnaces, and rolling-mills, it is possible to meet all the heat and power requirements from the coal fed into the coke-ovens—that is without using any coal in producers for the steel furnaces or in boilers for any portion of the power plant. Electrical engineers have been given the idea that there are in the coking and iron and steel industries enormous quantities of gas and waste heat which could be converted into electrical energy, and used for outside power purposes. Mr. Marshall says this is not so; and the misunderstanding has come about because hitherto the several processes have been carried on independently of each other; and the coal used on the producer and rolling-mill plant has been erroneously considered as a part of the fundamental requirements of iron and steel manufacture. In a properly co-ordinated undertaking, it is only at week-ends and at other times when the steel works end of the plant is shut-down that there will be any margin of power to spare. Mr. Marshall believes there are very great changes in sight, in view of the great advantages to iron and steel works in this matter of the proper internal utilization of their heat resources. Therefore, from these industries the electrical industry must not expect any great help.

Gas and Waste Heat from the Iron and Steel Industries.

Little has been heard lately of the doings of the Board of Trade Electric Power Committee. Now and again intimation appears in the Press that such and such a body has given evidence before it; but the exact character of the evidence is concealed from all but those who heard it. There is not so much secrecy exercised over a legal case in which great issues are involved; and surely this question of the future electricity supply of the country is a matter of considerable public interest. But during the war our Government departments seem to have become dominated in respect of all matters by the importance of concealment. It has got into their very veins; and all the officials live in an atmosphere of supreme privacy, mystery, and power. This has grown upon them, until secrecy is being carried to such lengths that it has become ludicrous. Secrecy and mystery by all means over matters concerning which information might be useful to the enemy. What purpose can be served by secrecy and mystery over the problem of the reorganization of the electricity supply of the country, no one outside a Government office can divine. We suppose this must be borne with the utmost composure that the absurdity of it all will allow. Our Scottish friends, however, have not hesitated to give some indication of the lines they have taken before the Power Supply Committee. At the recent Annual Commission of the Convention of Royal Burghs, Mr. Councillor Stevenson, of Edinburgh, said he had been before the Committee, and had intimated to them that there would be a marked difference of opinion when it was sought to unite private and municipal enterprises, or alternatively to eliminate one at the expense of the other. Nevertheless, he seems to be strongly persuaded that the elimination of private enterprise in electricity supply would be a good thing. He favoured municipal control on the ground that electricity supply is gradually becoming more and more a public necessity; and therefore it was not in the public

The Struggle for Supremacy.

interest that it should be in the hands of private companies, even if they were limited by a sliding-scale of dividend. We cannot quite follow the worthy councillor. A very large percentage of the commodities in which there are dealings are public necessities; and no doubt not a few of those who heard Mr. Stevenson are daily engaged in private enterprise in public necessities, but would hardly care to see the doctrine of municipalization carried the length of absorbing their businesses. They would probably question whether the municipal authority would be so competent as themselves to carry on the businesses; and whether it would be in the public interest that a change should be made. Whether or not something is a public necessity can hardly alone form the basis of a decision as to the propriety of municipalization. Public interest should have something to say in the matter; and public interest is not always well served by municipal authorities—at any rate, this side of the Border—whose supreme ideal of municipal trading is the gaining of fat profits to aid the rates. The public can have no better protection than private enterprise governed by a sliding-scale of price and dividend—that is to say, in normal times. In war times, when costs run up to a total necessitating charges of an unusual amount, the sliding-scale has to be relaxed; otherwise dividends are cut down to nothing but a shred, though the poor investor has to bear his share of the war burden and the extraordinary prices of those things which he requires internally and externally for the maintenance of life and activity. Mr. Stevenson went on to say that a combination of all electric supply companies and local authorities in each industrial district was quite impracticable, while any attempt to put all the electricity undertakings under a power company would create such local opposition that success along these lines could not be attained. Therefore, we can see no help for it, if Mr. Stevenson and municipalities generally are to be satisfied, except to municipalize electricity supply from one end of the country to the other. But different people, different views. The final decision rests with Parliament. It is also observed that Lord Provost Stewart, of Glasgow, and Mr. W. W. Lackie, the Electrical Engineer, have been before the Power Supply Committee, and have informed them that if the country is to be divided into areas for electricity generation, the Corporation will be willing, on satisfactory terms, to provide for the Glasgow and Clyde district.

THE INAUGURAL "TRUEMAN WOOD" LECTURE.

THE Council of the Royal Society of Arts, on the retirement of Sir Henry Trueman Wood from the office of Secretary, after 45 years' connection with the Society, desired to mark their sense of the great services rendered by him by instituting an annual lecture to be delivered to the Society. This lecture is to be called the "Trueman Wood" Lecture; and, in accordance with Sir Henry's wishes, it is intended to discuss some interesting point or problem in connection with the application of science to the needs of civilization. The Inaugural Lecture was delivered last Wednesday afternoon, by Sir Dugald Clerk, D.Sc., F.R.S.; and it was remarked by Mr. A. A. Campbell Swinton (the Chairman of the Council), who presided over the meeting, that it was singularly appropriate that the first of these lectures should be given by that gentleman, because the idea of thus commemorating Sir Trueman Wood's long service with the Society originated with Sir Dugald himself.

The subject which the lecturer dealt with was "Discovery and Invention"—a topic which enabled him to hold the attention of his audience for over an hour. He pointed out how common an error it is to confuse the functions of discoverers and inventors. As a matter of fact, he said, discoverers of the great order are rarely inventors; the type of brain power which is found in great discoverers being quite different from that of great inventors. Scientific research in physics and chemistry is of two kinds. One kind deals with the nature of the phenomena observed, and endeavours to arrive at some soul-satisfying explanation of the why and wherefore of a particular occurrence; while the other endeavours to discover hitherto unknown phenomena. Naturally, the earlier investigations dealt with known phenomena; and one type of discovery consisted in determining its laws. Take gravitation. This is as great a mystery now as in Newton's day. His discoveries supplied the law, but not the explanation. Many laws are known with considerable accuracy; but all reasoning on the facts leads up to the contradiction which inevitably follows the closer application of thought to theories of gravitation, cohesion, light, electricity, chemical action, and life. All appear equally inexplicable.

Though, he went on, no real explanation of any occurrence has yet been found, this does not prevent us from predicting the effects of alteration in circumstances, because the law is often known; and whether we understand it or not, the law permits us to know what will happen. Thus, though we have failed to understand gravitation, we can rely on the great law that attraction between bodies varies directly as the mass and inversely as the square of the distance. The great laws of thermo-dynamics, the mechanical equivalent of heat, and the law of heat conversion, known as the second law, may also be used for prediction. Practical use can be made of the facts without fully understanding them. The object of abstract investigation is to endeavour, by questioning Nature, to accumulate a sufficient basis of fact and law of sequence ultimately to arrive at some comprehension of the nature of matter and energy in its different manifestations—physical, chemical, and biological. This is the fascinating work of the abstract investigator; and its pursuit is of the utmost importance to mankind, apart altogether from any question of material gain. It is, and should be, conducted without any aim other than true understanding—nothing but abstract truth is its object. The complexity, however, of all Nature is so great, that progress can only be made by each investigator devoting his life to a comparatively narrow field. Work of this kind is not usually compatible with the power of invention required to meet the material needs of civilization. The abstract man must be intensely specialized; whereas the inventor must have a wide acquaintance with the properties of all the materials with which he works, as well as knowledge of the particular needs of the industry which he intends to improve. It is stated by many scientific men that inventors, designers, and manufacturers are culpably ignorant in neglecting the application of laws already known immediately to practice. The assumption is that application is easy and rapid, while discovery is slow and difficult. A short examination of the course of development of several leading inventions would show the true facts, and explain the reason of the frequent disappointment of scientific men in their efforts to apply their science to practice.

This examination Sir Dugald Clerk proceeded to undertake—beginning with Faraday's great discovery in 1831 of the induction of electric currents by magnets, and showing that 39 years elapsed between the discovery of Faraday and the invention, design, and application of a moderately successful machine embodying Faraday's fundamental principles. Indeed, by the year 1884, which saw the introduction of the self-regulating compound dynamo, 53 years had passed since Faraday's discovery of the fundamental action on which the great modern industry of electric light and power is now firmly based. The application of science to industry was undoubtedly a slow process in this instance.

In other great inventions, said the lecturer, the same slow process of development is always to be found. The steam-engine from Newcomen to James Watt and on to Parsons, followed the same course of step-by-step improvement. The long-continued action of many minds is also characteristic of the brilliant progress of the internal-combustion engine. As far back as 1680 Huyghens proposed to use the explosion of small charges of gunpowder in order to obtain motive power; and Papin ten years later continued his experiments without any success. Internal combustion engines were proposed long before the inventors could have availed themselves of thermo-dynamics. The first definite and accurate proposal to compress the charge before its explosion was put forward by William Barnett in 1838; and now, some 79 years later, we are still inventing and designing new and better internal-combustion engines, and shall certainly take many years longer without approaching finality. From about 1877 down to the present time, however, the science of thermo-dynamics has been fully applied, and the practical experience of the designer has suggested lines of research into the phenomena of combustion and flame; so that quite a considerable body of abstract science has arisen around these engines which would not have come into existence without the stimulus of a great industry. Many abstract physicists and chemists have contributed to the discoveries made in connection with the working fluid; but the engineers engaged in the design and construction have also thrown great light upon the scientific side. Thus, in the experimental development of the explosion gas-engine it was quickly found that the properties of gaseous explosions had not been thoroughly investigated by the abstract investigator. In 1876, when the lecturer began work upon the subject as an inventor and designer, he could find no record of experiments made upon the maximum pressures attained by varying mixtures of coal gas and air mixed at atmospheric pressure and ignited by electric spark or flame. The only experiments in existence were those of Bunsen conducted in small glass tubes.

Many other facts were cited by Sir Dugald Clerk in proof of his contention that science is indebted to industry for its stimulus and progress in many of its achievements, and history is indebted to science for much information of the fundamental laws necessary for clear thinking in invention and design. Science is, he concluded, succeeding admirably in discovery; and important inventions are evolved slowly by the labours of great numbers of men who may encounter failure after failure through many generations. But yet inventor follows inventor, like soldiers in battle, until success comes at last. Great inventions are never the work of one man.

Pitch and Creosote Mixtures for Diesel Engines.—The recent Order of the Ministry of Munitions regulating supplies of tar-oil for use as fuel in Diesel engines was considered and discussed at the November meeting of the Diesel Engine Users' Association. Reference was made to the condition in the schedule, that acceptance of the producers' weights and measurements in selling tar-oil should be compulsory on the purchaser. It was reported that the Controller of the Mineral Oil Production Department of the Ministry of Munitions was arranging for trials of mixtures of pitch and creosote to be carried out with a view to their adoption for use as fuel for Diesel engines. The hope was expressed that actual users of Diesel engines under normal working conditions would be given an opportunity of thoroughly testing any such fuel before a final decision was arrived at by the Controller as to its suitability.

THE DAVIS GAS-FURNACES.

FURTHER DEVELOPMENT BY THE DAVIS GAS-STOVE COMPANY.

(*Concluded from p.* 460.)

INDUCED DRAUGHT SECTION—HIGH-SPEED STEEL FURNACES.

CONTINUING the survey, we are next introduced to a high-speed steel furnace of the twin chamber type. The lower chamber is 14⅜ in.×16 in.×6½ in.; and the upper one 14½ in.×16 in.×6½ in. This particular one is fitted with twin-jet atomizer burners for oil, with gravity-feed, under 20 lbs. per square inch air pressure. It is suitable for any working temperature in the lower chamber up to 1500° C., and in the upper one up to 1000° C.

The next example is one over which a little more time is spent. This is one of the smallest—and one of the newest—of the firm's regular series of high-speed steel-hardening furnaces of the double chamber type; the pre-heating chamber being 9 in.×15 in.×5½ in., and the finishing chamber 8½ in.×14 in.×5 in. It is (fig. 3 clearly shows) of substantial cast-iron plate construction. The firebrick lining, we were informed, is of special quality refractory material, selected after careful tests as the most suitable for the exacting requirements of this high-temperature work. The section is extremely heavy at all points, in view of the high temperatures prevailing—thus ensuring a substantial reserve of heat with a minimum loss through radiation. A door of the rise-and-fall type is provided for each

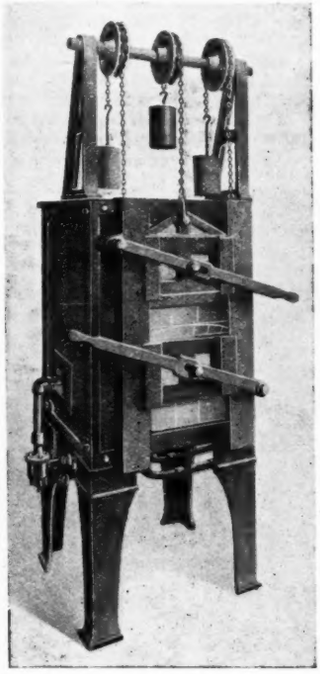


Fig. 3.—High-Speed Tool Furnace, with Counterbalance Doors.

chamber, complete with the necessary counterbalance gearing—the actuating levers being carried to the sides well away from the heat. The ease of working these counterbalanced doors is a feature which enables the inspection of the splendid heats in both chambers—in the top one about 1000° C., and in the lower 1500° C. Glancing through a porthole, the white heat in the combustion chamber was also witnessed; and no doubt was left in the mind as to a margin being there above the 1500° C. The chambers are side-fired by Davis's patent air-blast burners for gas at ordinary main pressure, with air-blast of 3 lbs. pressure to the square inch. It is worthy of note that the flame does not come into contact with the work. By means of controls of the burners, any kind of flame can be obtained, ranging from a reducing to an oxidizing flame.

For those establishments in which small quantities of high-speed steel have to be dealt with, a specially-designed furnace—see fig. 4—has been constructed. Though small, it is strongly made, and is in every way suitable for rough workshop use. Briefly described, it is of the twin-chamber type, fitted with a pre-heating chamber 4 in. × 10 in. × 2 in., in which the steel is given a preliminary soaking heat. The bottom chamber is muffled by a silica tube, capable of withstanding the highest temperatures. The work to be heated therefore does not come into contact with the flame. The dimensions of the lower chamber are 3¼ in. diameter by 9 in. long. Stopper bricks are provided for both chambers. The working temperatures can be carried to 1500° C. in the bottom chamber, and to 1000° C. in the upper one. The heating is effected by air-blast burners for gas at ordinary main pressure, with an air-blast of 3 lbs. pressure per

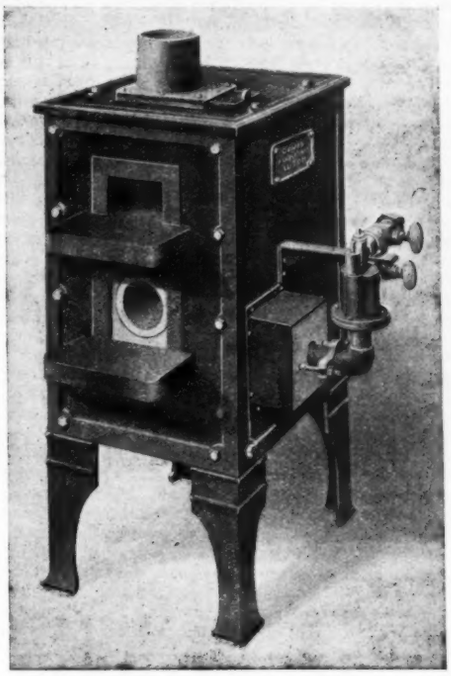


Fig. 4.—Furnace for Small Quantities of High-Speed Steel Tools.

square inch. The equipment of the furnace, it is seen, is in every way complete, and includes regulators and control cocks for the burners, flue nozzle, and sliding damper.

Next is a neat little high-speed steel furnace, which is intermediate between the small portable size furnace just described and the firm's regular series of high-speed hardening furnaces. The design is such as will meet the requirements of works wanting larger hardening furnaces than the portable type, but whose work in high-speed tools is not sufficient to justify the installation of the furnace illustrated by fig. 3. Here, again, the furnace has two heating chambers—the upper one (working up to 1000° C.) for pre-heating, and the lower one for raising to the final hardening temperature. The interior working dimensions of both these chambers are the same—*i.e.*, 5½ in.×9¾ in.×3⅜ in. high. A cast-iron trivet is fitted underneath each door opening for handling the work, and stopper bricks are supplied for each chamber. The particulars as to burners, gas, and air-blast pressure are the same as in the case of the two previous furnaces; and in this instance also the flame does not come into contact with the work, while any kind of flame can be secured, ranging from reducing to oxidizing.

TOOL MAKER'S OUTFIT.

An interesting feature next presents itself (fig. 5). It is a self-contained tool maker's outfit, and is capable of manifold purposes.

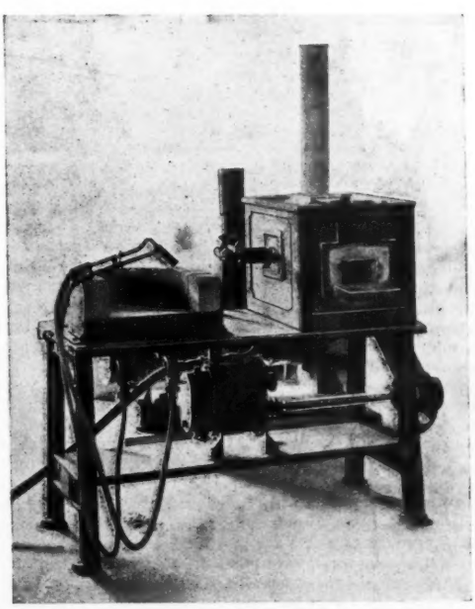


Fig. 5.—Tool Maker's Outfit.

A substantially built cast-iron table is carried on A shape legs of heavy section, with a shelf below the table top. This shelf (which braces the legs together) provides accommodation for a high-pressure Roots blower, which in the standard type is driven by a belt and fast-and-loose pulleys. If preferred, the blower may be driven by an electric direct-coupled motor. The blower delivers air to the oven furnace and blow-pipe. The oven has a heating chamber 5 in.×9 in.×3½ in. high, built-up of cast-iron plates lined with firebrick. It is heated by Davis's patent air-blast burner, and can be raised to a temperature of 1350° C. The smith's hearth, of Ω shape, is made of sheet-iron, lined with firebrick, giving a clear working space 12 in.×12 in. The blowpipe is 15 in. long×⅞ in.; the nozzle being ⅞ in. diameter at the head. The blower (the power required to drive which is only ½ B.H.P.) is of sufficient capacity for supplying both the oven and the blow-pipe. It is noticed that all the necessary connecting-pipes are included in the equipment, to render it a self-contained outfit.

Forging Furnaces.

Just a passing reference to a couple of forging furnaces—one gas and the other oil heated. The former has a working chamber suitable for accommodating bar and rod from ½ in. to 2 in. diameter, to be heated to any length up to 1 ft. 6 in. It is fired by air-blast burners for gas at district pressure, under 3 lbs. per square inch air pressure. This furnace is suitable for forging temperatures up to 1250° C. Regarding the oil forging furnace, it has a working chamber suitable for accommodating rod and bar from ½ in. to 6 in. diameter, to be heated to any length up to 2 ft. It is fired by a fan air-oil burner for oil with gravity feed, under 1 lb. per square inch air pressure. It is suitable for all temperatures up to full welding heat. It is wonderful what can be done with oil; the heats realized are very intense. Forging work can be done with 8 to 12 gallons of oil per ton, according to the weight of the work.

Large Industrial Furnaces.

In the centre of the demonstration room are two large industrial furnaces; and both are samples of furnaces that can be built to any length by adding more sections. These are heated by oil. In the first one, the heating chamber has a clear working space 2 ft. 9 in. × 8 ft. 8 in. × 1 ft. 8 in. high. It is built-up of a series of semi-arches, over-fired. The heating arrangements are reversed with every succeeding arch, so as to get uniform heating throughout the length—that is to say, the flame plays up through a porthole from one side and over the underside of the arch, while for the next arch the burner is situated on the opposite side. Fan air burners are used with gravity feed under 1 lb. per square inch air pressure. Arrangements are provided for the preheating of the air in the main flue under the working-floor. The working temperatures here run up to 1350° C. In the neighbouring furnace, there is a heating chamber which gives a clear working space of 2 ft. 10 in. × 10 ft. 6 in. × 2 ft. high. In this case, there is under-firing. Below the floor of the furnace, there are transverse arches forming four combustion chambers. As in the previous case, the heating arrangements are reversed with each arch. Twin-jet atomizer burners for oil are used, with gravity feed under 20 lbs. per square inch air pressure; the working temperature running up to 1100° C. This furnace can be fitted with low-pressure oil-burners, in which case the section arch is built on top of the furnace, and the main air-pipes are carried between the two arches so that the air is preheated.

A Big Experimental Furnace.

Close by a large experimental furnace was being built at the time of the visit. It is an advanced type of regenerative oven, heated with gas at main pressure, and air at low pressure. In this case, what the firm has done has been to try to forecast the natural development of the regenerative oven furnace, as they believe it is only in this way that gas will be able to tackle big jobs from which it is to-day practically excluded. In other words, it is an attempt to materially increase the scope of gas-furnaces.

It might be mentioned here that practically the whole of the furnaces can be, by modifications, made suitable for use with producer gas; and the firm have furnaces specially built for use with this fuel.

Other Furnaces.

It will have been seen that the demonstration room is well equipped with furnaces of many types, and there are yet two or three to which we may refer. One is a single hole 8-in. shell-nosing furnace, gas-fired, with the gas at district pressure, and air at 3 lbs. per sqnare inch, fitted with the firm's patent self-intensifying air-blast burners. It can also be supplied for heating with oil, using the twin-jet atomizing burner. The furnace seen is only typical. It can be supplied in different sizes as regards the number and sizes of shells. It may, where required, be fitted with water-cooling devices.

Here too is a drying-stove for shell-lacquering, varnishing, &c. This type of stove is made in a variety of sizes; but the one seen has a heating chamber 4 ft.×3 ft.×6 ft. high. It is of the treble-cased type, in which the products of combustion do not enter the heating chamber. It is fitted with atmospheric burners for gas at town pressure; and is suitable for working temperatures up to 500° C. It is fitted with bogie, grid shelves, and thermometer.

For lead melting is shown a furnace fitted with an iron crucible 25 in. diameter by 15 in. deep. Its capacity is 20 cwt. of lead; and it is provided with an anti-oxidation hood. Fitted with self-intensifying burners using gas at town pressure, the furnace is suitable for melting any soft metals having a fusing-point up to 600° C.

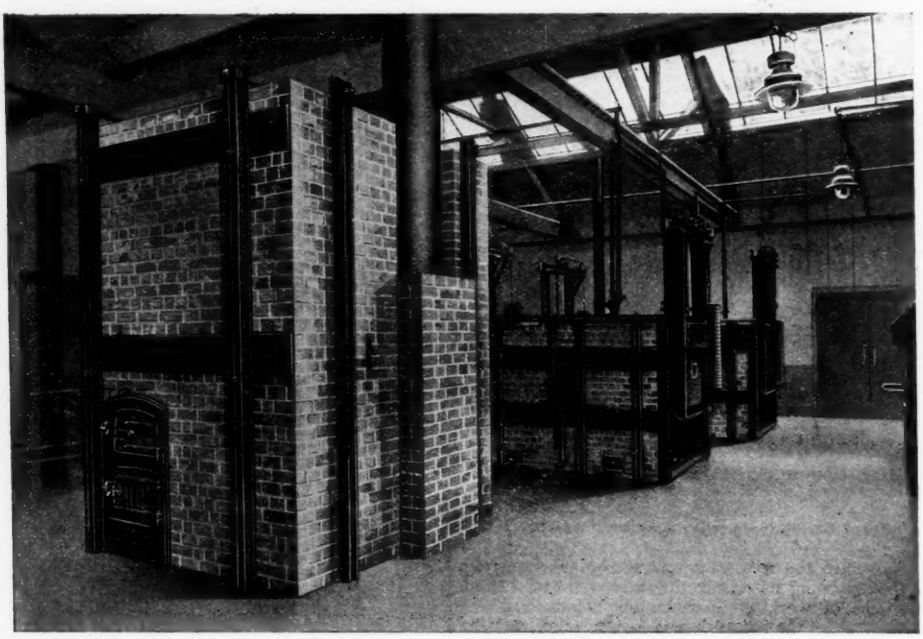


Fig. 6.—Large Industrial Furnaces.

The description here given of the furnaces is necessarily only of a fragmentary kind. Fuller details would carry us into too elaborate an account; but what has been said shows the degree of the development to which the furnace department of the firm has been effected, with indications of the work in hand to penetrate further and bring to actuality the possibilities that present themselves.

A Few Notes on the Furnace Burners.

In the description of the furnaces, reference has been made to various burners; and in furnace efficiency the burner takes an important part—in fact, it is an essential to success in any type of furnace. We can only glance at some of the features, which were explained to the writer in the experimental shop. A common characteristic of the various types is the employment of the Venturi mixing tube.

The high-power ring burners are ordinarily used for town gas at main pressure; but they are equally suited for town gas at in-

duced pressures up to 15 lbs. They can also be used with a slight fan air pressure of 6 in. water column and over. It is a strong burner, made in three sizes—50, 65, and 90 c.ft. per hour. The top is a separate casting, and can be drilled with any number of holes, and also be provided with rests for any small isolated boiling operations.

Fig. 7.—High-Power Ring-Burner.

The firm's patent self-intensifying burners have been frequently mentioned in the article, in connection with the use of gas at ordinary main pressure. They are also supplied in form suitable for burning high-pressure gas at pressures up to 15 lbs. per square inch, or with fan air pressures of 6 in. water column and over. The burner is made in many types and varieties. But the principles of construction are the same; and they assure the generation of a highly aerated and intimately associated mixture, the burning of which results in an intensely powerful flame. The special gratings by which the mixing is accomplished provide also the

Fig. 8.—Types of Self-Intensifying Burners.

means of pre-heating the secondary air necessary to complete combustion; thereby intensifying the flame, and correspondingly reducing the consumption of gas necessary to maintain the full working temperature of the flame. The gratings are made separate from the body of the burner, so that they can be replaced if necessary, although up to the present the firm have not had occasion to renew any sent out. This is good testimony.

The air-blast burners to which reference has also been made are particularly suitable for operations in which high temperature or great concentration of heat is required, and may be used to advantage with air pressures of from 3 lbs. to 7 lbs. per square inch. In such burners, the essential features are a readily manipulated gas and air regulator, and an intimate admixture of gas and air, in order that the advantages of the air pressure may be fully utilized. That these requirements have been adequately met by the Davis patent air-blast burner is apparent from an examination of the construction, which ensures a perfect mixture irrespective of the hourly consumption. We cannot go into the details here, though interesting; but the illustration gives some idea of the internal means provided to ensure an adequate mixture.

A number of other burners (some for oil, some for producer gas) were shown to us in the experimental shop—all testifying to a studied intention to realize from them a high efficiency.

The experimental shop, like the demonstration room, is fitted with all the appliances necessary for carrying out burner tests in conjunction with different apparatus—whether it be with gas at various pressures, or with gas at district pressure and air under pressure, or with oil-burners, or producer gas matters not. The

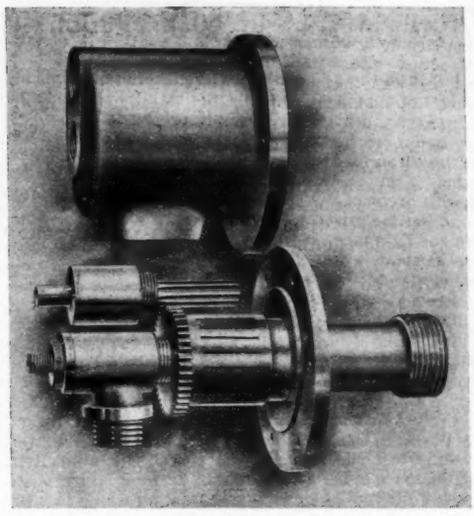


Fig. 9.—Air-Blast Burner.

equipment is there, and all measurements can be made. Nothing need be accepted upon the bare assertion of anyone; and because of this it was found that a visit to Luton in connection with the new furnace department has been not only interesting but most instructive. The experience gained can be that of any gas engineer or manufacturer.

High-Temperature Furnace Work.

Particulars as to the satisfactory use of gas for treating tractor wheel spokes are given by Mr. Harry L. Wolff, the Industrial Gas Engineer to the Rockford (Ill.) Gas Company, in a recent issue of the "American Gas Engineering Journal." The chief operation which it was desired to carry out was the heating of the spokes at the end for 6 in.; each piece being heated twice, and passing through two operations—the roughing and flattening. What was needed was practically a welding heat; and the first furnace-lining, which was of fire-brick, with a facing coat of corborundum, was not entirely satisfactory. Therefore the furnace was re-lined with high temperature cement, which has proved to be the best kind of lining for the purpose. The heating chamber is directly under the work; and there is an adjustable top to the forge which may be raised or lowered to just permit the entrance of the piece to be heated. The burners each enter at the bottom of a circular vertical chamber, 6 in. diameter and 4½ in. deep; the wall between the chambers being ¾ in. thick at the narrowest point. Use is made of ¾ in. gas-pipe burners, with the end open. Gas is supplied at 4 in. pressure, and air at 1½ lbs. With two of the furnaces, it is easy to reach the desired daily output of 2000 spokes; the gas consumption of the two, at the best working speed, being 1200 c.ft. per hour. The furnaces referred to have proved so satisfactory in use, that other installations have been put up. In an agricultural implement factory, ploughshares are being welded; and the operations are free from the constant trouble which was formerly caused by the many changes in the specific gravity of the oil used for fuel and the fluctuations in costs.

The Late Mr. Hawksley's Connection with Nottingham.—The death of Mr. Charles Hawksley [*ante*, p. 455] removes one of a family which, in an important capacity, has been intimately concerned in Nottingham's public work. His father, Mr. Thomas Hawksley, was Engineer to the Company at the time supplying water to Nottingham, and designed the works on Trent-side, that have been long since abolished; this being the first undertaking of the kind to give a constant supply to a large town. Mr. Thomas Hawksley was also the Engineer to the Nottingham Gas Company, whose powers were acquired by the Corporation. Mr. Charles Hawksley's interest in regard to Nottingham was maintained almost until the last; it being only about two years ago that he was responsible for a generous benefaction to the High Pavement Unitarian Church.

Ceylon Monazite Sands.—The Principal Collector of Customs at Colombo (the Board of Trade Correspondent for Ceylon) reports, says the "Board of Trade Journal," that an official statement has been made to the local Press respecting the mineral survey which has been conducted in Ceylon in co-operation with the Imperial Institute. The survey, it is stated, has led to the discovery of beach deposits of monazite sand which will usefully supplement the commercial supplies of thoria required for the manufacture of incandescent gas-mantles. Samples of the sand have been investigated by the Imperial Institute; and the results have been so promising that the Ceylon Government have arranged to work the deposits. Details of the arrangements are not yet available; but suitable British concentrating machinery has been selected by the Institute for the purpose, after experimental trials, and will shortly be shipped to Ceylon.

THE ECONOMICS OF COAL PRODUCTION.

In a paper on the above subject, before the London Section of the Society of Chemical Industry, on Tuesday last, Prof. HENRY LOUIS (the President of the Society) emphasized the serious position which Great Britain is likely to find herelf in unless heed is taken of the increasing cost of coal. It was too often overlooked, he said, even by those in authority, that Britain's greatness is built essentially upon the foundation of a cheap and abundant supply of coal; and it was impossible to doubt that when this supply should fail us, the hour of Britain's decadence would have struck.

As a starting point, he gave the following rough average of the cost of getting coal, based on figures for the year 1913: Royalty, 5·35 p.ct.; wages, 62·55 p.ct.: materials, 16·45 p.ct.; administration, 7 p.ct.; interest and profit, 8·65 p.ct.—the official figures for the cost of coal being 10s. 1·5d. per ton at the pit mouth and 21s. (seaborne) delivered in barges on the Thames. It will be seen that wages represent more than two-thirds of the value of the coal at the pit's mouth; and it is realized, having regard to the increase in wages that has gone on since 1913, that anything that can be done towards reducing the cost of the other items is of small significance compared to that of keeping labour costs within reasonable limits. The hewing cost now forms no less than one-third of the cost of the coal at the pit's mouth. This item has been continually increasing for many years; and the increase has been enormously greater during the war than at any other period. Coupled with this, and the belief that wages will never come down to their pre-war level, is the fact that the output per worker has decreased, and that, as a rule, increases in wages, have not improved the status of the miner—he has only taken advantage of them to do less work. In the decade 1893–1902 the output was 295 tons, and in the decade 1905–1912 it had dropped to 280 tons.

Reviewing the items, other than labour, Prof. Louis said it was fairly obvious that neither the colliery owner's profit nor the coal owner's royalty leaves much margin for reduction; but there were one or two directions in which administration and materials might be reduced in cost. One of the most promising methods of dealing with the situation would be by a close federation among the colliery proprietors. If, for instance, all the collieries in a coal-field were federated and administered as one large unit, the costs of administration would be reduced, and selling charges would be greatly decreased, because the elimination of competition would avoid the necessity for the numerous agents and merchants who were now maintained by the coal trade. Materials could probably be purchased to better advantage and more cheaply by so large an organization; and it could maintain a staff for the special purpose of conducting researches with a view to cheapening production on a scale that was impossible for the existing smaller companies. Above all, if the coal production of the country were concentrated in the hands of a very small number of large organizations of the kind, it would probably be possible to mark out definite areas within other coalfields which would refrain from competing, and thus reduce the amount of transport of coal to a minimum.

In spite of all this, however, labour is the *crux* of the question; and if the rate of wages is not to go down—and Prof. Louis is not alone in thinking it is not at all likely to do so—the only chance of reduction in this item would be by increased output. This might be obtained to some extent if it were possible to get the miner to see that the only salvation for the industry in the future lies in increased production, or it might be brought about by the more extensive and better application of mechanical methods.

DISCUSSION.

Mr. CHARLES CARPENTER, D.Sc., said the restriction of output by the workman was one of the most serious problems that had to be faced. Unfortunately, most of the antagonism was based upon the idea that the future prosperity of the working man depended upon the output of work. This was found not only in the unskilled trades, where one might expect to find it owing to lack of training and a somewhat low standard of knowledge, but also in the highly skilled trades. They were all imbued with the idea that the less they did the more work there would be for them. To what extent it was based on the fear of unemployment, it was difficult to say; but allowance must be made for this fear when one considered the conditions under which labour mostly earned its living. There was the uncertainty whether the next week would bring a full week's work or whether it would mean the end of that particular job. When they considered the doubt as to whether there would be the ability to obtain sufficient money to pay the rent and to buy food for the wife and children, it would be understood that the dread of unemployment must be very pronounced in the working man's mind; and to some extent it accounted for the determination to obviate it by restriction in output. One would have thought that the conditions through which the country was passing would have opened the eyes of labour generally to the seriousness of that problem; yet that was not the case, and it showed how deeply-rooted was this fear. With regard to the coal industry, it was the fact that a large amount of coal when it was brought to the surface was very badly cleaned, and the amount of dross and dirt in it now was enormously greater than it was in normal times. The reason was that the proper amount of male labour for the picking belts was not available. The war had taught them what an enormous amount of work could be performed by women labour, even of the most strenuous kind; but the labour of the picking belts was not of this arduous character. There was not enough male labour to do the work; and the result was that a tremendous amount of dross was sent away with the coal which now cost such high prices. It was, however, work which women could easily do; but the Unions were so short sighted that they would not allow women labour to be employed on the belts. If the working man in industry took this short-sighted view, he was afraid there was no hope. It did not very much matter whether we won the war or lost it; we should lose our future unless we could change the attitude of labour. How was it to be done? It was all very well to blame labour; but had sufficient trouble been taken to teach labour its responsibilities in this matter? Had we begun, as we ought to have done, at the schools? Had we seen that the system of training and teaching was the right and proper one to bring up the young as good citizens? He was afraid we had done nothing of the kind. In a large majority of cases our education had been conducted on the cheapest and most chandler shop lines; and yet it was vital to the progress of the nation as a whole. So that, however we might blame labour, we must bear a great deal of the blame ourselves. This was one respect in which the employers must alter their views as well as the men. One point which he knew was controversial, but which should be mentioned, was the export of coal. He thought the authorities were now alive to the fact that the coal industry was a national one—using the word national in a bigger sense than it had been employed in the past. There were responsible people concerned with problems of reconstruction who realized that one of the most important aspects of reconstruction was with regard to coal; and he thought he could say this, that not only did they realize it was true of coal, but they realized that it was true of all minerals, first of all, of the kingdom and, secondly, of the empire. And if the programme which he believed would be carried out was carried out, we should see, as one of the fruits of reconstruction, a broad-minded view in which all the possibilities of the kingdom were taken into account. Much was left to private enterprise in the past. He believed it was true there was no record of the various borings which had been made in different parts of the country. Borings had taken place for minerals of one kind and another of which the State had no knowledge whatever. This, of course, was clearly wrong. The State ought to be in touch with every development which was going on throughout the kingdom. He thought in all probability there would be some method by which the minerals, including coal, throughout the Empire would be kept in touch with some central authority; so that we should not again do what we did at Travancore, where we turned the mineral rights over to the Germans because our authorities reported that the mineral there was not monazite but something else altogether. Referring again to coal mines, the difficulty with regard to coal cutting had not been altogether due to the mine owners. There was the prejudice with regard to their use by the men, and the general view of labour towards the carrying on of work by machinery. It was a matter which rendered it very difficult for the capitalist to make up his mind to put down machinery, because the expressed policy of labour was that the employers could put down machinery but labour would regulate the output. He believed the attitude in the States was different; and it would be interesting to know why the workmen there were so very much more enlightened in this respect than they were over here.

Mr. ARNOLD LUPTON said he foresaw the day when royalties would be much higher than they are now. In his opinion, it would be best for the State to buy out the coal owners at a fair price. With regard to boreholes, the Geological Department officials usually found out all that had been done; but the point was that if £10,000 or £20,000 had been spent by a company to ascertain facts for their own private use, they did not want to make everybody a present of the information. From Mr. Carpenter's remarks, he gathered that he would commandeer the information without paying for it.

Prof. J. S. S. BRAME thought we should have to reduce our export of coal in the future if we did not wish to hasten the day of dear coal at home. It would be interesting to know how the output per man on the Continent and America compared with the British output. The generation of electricity for use in the collieries should, he considered, be more general, as this would save much of the waste now going on, and incidentally provide revenue from bye-products. He did not think there was much future for briquetting low-class coal.

Mr. W. H. QUARRELL said that in the United States the production per man was 596 tons in 1897, and 660 tons in 1912. The feature of the future working of collieries was to deal with the thin seams; but a leading Lancashire colliery manager had given it as his experience, after a test, that working a 2 ft. seam he would not expect more than three-quarters of a ton per man per day.

Major J. E. MORGAN said that greater output could be obtained if the miner was guaranteed that his rate would not be cut because he earned high wages. One of the reasons why the output was so great in America was the thickness of the seams. At the same time, many collieries here working on 2 ft. seams were getting much better results than that mentioned by the last speaker.

Mr. WALTER REID suggested that economies would follow if coal was gasified either down in the pit itself or at the pit's mouth and used for generating electricity, because it was cheaper to transmit electricity than coal. In this way large installations could be erected for burning dust. He thought the use of dust or pulverized coal under boilers at the pits for generating electricity would be the solution of the problem as far as power production was concerned.

Mr. J. W. GORDON called attention to the fact that, although the freightage on seaborne coal was much less than that of rail borne coal, yet the price of the former was the same, and seemed to be regulated by the latter.

Mr. J. R. COWBURN suggested legislation to reduce the railway rates as one means of keeping down the price of coal.

Mr. NORMAN SWINDEN considered that the increased output per man in America was due to scientific management and the working out of bonus systems. It was quite possible for costs to be considerably decreased and the men's wages to be doubled.

Prof. LOUIS, in reply, said that a reduction in railway rates wou not reduce the cost of coal, because the country would have to bear the cost in some form. Even if the Government took over the railways and carried coal free, it would not reduce the cost of bringing coal to the consumer. As to gasifying small coal and dust, there had

not yet been made a producer which would satisfactorily deal with dust; and this problem, which had been considered before, was nowhere near a satisfactory solution. From investigations he had made, he had come to the conclusion that, for short distances, it paid to transmit electricity rather than coal; but for long distances, he doubted whether it was cheaper. He was glad that Mr. Carpenter had struck what he thought a high note and the proper note—viz., that it was every man's duty to do a fair day's work; and if this could only be impressed on the nation, a very valuable piece of work would have been accomplished. How it was to be done otherwise than by education he did not see. One of the faults of the past century or more was that wages had been based on prices. The working man then said to himself the less work he did the higher the price and the better his wages would be, without his doing any more work. Surely the proper attitude was to base wages not upon prices, but upon output. The question was a difficult one. Nobody had yet solved the proper bonus system to be applied; and he admitted he did not see any solution yet. At the same time, he did not think solving the problem was beyond the wit of man. It would be possible to devise a system in which all the workmen in any industry would be interested in the results of the industry from the point of view of output; and the moment they found their interests were bound up with large outputs, then the problem would be solved. Until that time, he confessed he did not see how they were going to get out of the difficulty which must be got out of if the best was to be obtained from our coal, and it was to be at least as cheap as that of other nations.

BENZOL AND TOLUOL RECOVERY IN AMERICA.

Report by the United States Bureau of Standards.

The latest issue to hand of the American "Gas Age" contains a lengthy instalment of a report by the United States Bureau of Standards to a Committee appointed by a conference held in Washington to collect information and advise the Public Service Commissions in regard to the possibility of a Federal demand for toluol and other bye-products from manufactured gas. The Chairman of the Committee is Dr. E. B. Rosa, the Chief Physicist of the Bureau of Standards. The report is mainly devoted to describing the process of oil-washing; but attention is first devoted to showing the need for far more benzol and toluol than can be obtained from coke-oven plants.

Though, it is stated, several months have elapsed since the United States entered the war, comparatively few gas-works are equipped to recover the materials referred to; but the prospects are that in the near future they must do so if the requirements for high explosives are as great as is anticipated. Major Burns, of the Ordnance Department, stated that the army is dependent upon toluol for the manufacture of T.N.T. for shells. There is at the present time about 4,000,000 lbs. per month of T.N.T. nitrating capacity; and sufficient toluol is not now available to utilize it. It is therefore now impossible to place more orders for T.N.T., primarily because more toluol is not available.

The amount of benzol and toluol formed in any one of the processes is by no means definite. It depends on the operating conditions and the quality of the raw materials—coal or oil. It would therefore be impossible to predict exactly what the yield in a given case would be; but an extensive inquiry into the operation of several typical plants has given the following approximate figures for the various processes. These figures are averages of the results obtained in twelve plants investigated.

Approximate Yield of Crude Light Oils.

Per Short Ton of Coal Carbonized.

Horizontal-retort coal gas	3·0 gallons
Coke-oven gas	2·6 ,,
Continuous vertical-retort coal gas*	1·8 ,,
Carb. water gas, per cent. of volume of gas oil used	10 p.ct.

Yield of Pure Products.

	Benzol Gallons.	Toluol Gallons.
Horizontal-retort coal gas—per short ton of coal carbonized	1·32	0·45
Coke-oven gas—ditto	1·47	0·35
Continuous vertical-retort coal gas*—ditto	0·27	0·26
Carburetted water gas‡—per 1000 c.ft. of gas.	0·15	0·07

No specific data are available for the amounts of toluol present in oil gas, although it is understood that the oil gas distributed on the Pacific Coast contains at least as much toluol as does coal gas.

Assuming that a ton of coal gives 10,000 c.ft. of gas, and that 3·5 to 4 gallons of gas oil are used per 1000 c.ft. of carburetted water gas, it is evident from the table that the amount of toluol obtainable per 1000 c.ft. of rich water gas is considerably greater than that obtainable from coal or coke-oven gas.

It does not seem likely that it will become practicable in the near future for plants having outputs less than 100,000,000 c.ft. per year to recover light oils. A survey of plants of this size and larger indicates that there are about 112 plants having an aggregate annual gas output of about 135,000,000,000 c.ft., of which about 97,000,000,000 c.ft. is water gas, 25,000,000,000 c.ft. coal gas, and 13,000,000,000 c.ft. oil gas. What annual output of toluol could be expected from washing all this gas is problematical. It seems, however, that at least 0·05 gallon of toluol per 1000 c.ft. of gas could be expected, which would give a prospective toluol recovery from all these companies of about 7,000,000 gallons per year. It appears likely that, with an adjustment of standards, the benzol production from the same amount of gas would be between three and four times as much as the toluol production, or approximately 18,000,000 gallons. These yields are by no means the maximum obtainable, since the production in some existing plants is higher than 0·05 gallon of toluol per 1000 c.ft. A few of the plants included in this estimate are already recovering part of their toluol and benzol; but by far the greater part of the available supplies are not yet recovered.

Benzol, toluol, and the related hydrocarbons collectively designated as light oils, are present in city gas as condensable vapours, and are associated with other hydrocarbons of the olefine and the paraffin series, which possess many physical properties similar to them. To separate some of these substances—especially the paraffins—from the light oil by commercial methods is well-nigh impossible; and therefore it is important so to control the conditions of gas manufacture that as little of these substances will be present in the light oils as is possible. The presence of more than 2 p.ct. of paraffin compounds in toluol is said to make it unfit for the manufacture of explosives. Only by careful attention to the temperatures and other operating conditions maintained in the gas-making process, and by the use of suitable raw materials, can the gas manufacturer be certain that the toluol obtained from his light oils will be saleable. For example, in the recovery of light oils from water gas, not only the temperature but the rate of oil injection, spacing of chequer-bricks, &c., all affect results. Dirty chequer-bricks are said to be a common source of high paraffin content in the toluol produced. The favourable conditions can only be determined by trial in each particular case.

Composition of Crude Light Oils.

	Benzol.	Toluol.	Solvent Naphtha, Wash Oil, Naphthalene, &c.	Paraffins.
	P.Ct.	P.Ct.	P.Ct.	P.Ct.
Horizontal-retort coal gas	38	16	46	Less than 2†
Coke-oven gas	55	14	31	Less than 2†
Continuous vertical-retort coal gas*	15	15	58	12
Carburetted water gas	42	25	33	Less than 2†

* Results from only one continuous vertical installation included here.

† This amount may be exceeded under some operating conditions, but paraffin can usually be kept down to this figure, except with certain fuels.

‡ The yield variable according to the amount of oil used in manufacturing the gas; being equivalent to about 2 to 2·2 p.ct. of the gas oil used in the plants investigated, but perhaps only about 1·6 p.ct. in many cases.

Measuring Lengths of Pipes upon Racks in Stores.—A useful folding steel rule, suitable for measuring pipes stored on racks, without removing them, is described by Mr. A. L. Schneider, of Clarksburg, in the "Wrinkle Department" of the National Gas Association of America. It comprises six sections each 4 ft. 2⅛ in. long, so pivoted together that, when extended, one section overlaps the next by the odd 2⅛ in.; and a bolt is passed through corresponding holes in each section, by which the whole is kept stiff in line. At one end there is a projecting pin; and the rule is passed through the pipe to be measured, with the point downwards, until the pin clears at the other end. It can then be drawn back until the pin bites on the edge of the pipe. Starting from the pin as zero, a scale is marked in any convenient standard of length, on which the length can be accurately read off at the other end. The whole length must be sufficiently small in section to freely pass through the pipes.

At a meeting of the Midland Section of the Coke-Oven Managers' Association at Sheffield next Saturday, Mr. G. A. Hebden, of Parkgate, will read a paper entitled "Ammonia and its Compounds."

It is stated from an American source that the bore of an ordinary iron pipe can be rendered rust-proof by coating the surface with tar and filling with light, dry wood sawdust. Light the sawdust, and when fully burned clean out the pipe, which is then ready for use.

A recent letter from Argentina states, according to the "Petroleum Review," that natural gas has been discovered on the northern borders of that country, in the delta of the River Parana. The gas is said to be in sufficient quantities to be commercially available; and the discoveries are being followed up by further drilling.

GAS FIRING BOILERS.

A paper on the subject of the gas firing of boilers was read before the Institution of Electrical Engineers in London on Nov. 22, by Mr. T. M. HUNTER. It dealt very exhaustively with the problems involved, and discussed the properties of coke-oven gas, blast-furnace gas, and producer gas. To some extent the paper was historical, and in others elementary; but this was inevitable, owing to the author's desire to treat the matter comprehensively.

Leaving on one side the sections of the paper dealing with the suitability of gas for boiler firing, the drying and cleaning of gas, heat transfer, and the matters relating to boiler draught and settings, we give a few extracts from the author's views of the practical considerations affecting combustion. Until a proper combustion arrangement is provided, the author said, little progress can be made. Good combustion can only be obtained by providing an intimate mixture of air and gas. Complete combustion should take place very rapidly at the highest possible temperature, and with the smallest possible excess of air. At different plants not only are gases with different analyses, different temperatures, and different pressures found, but the conditions also vary as to type of boiler, draught, and load. Each case has to be considered in all its details. It is not always safe to say that a certain combustion arrangement will suit because it is working successfully in another plant under somewhat similar conditions.

The original method of burning gas in boilers was simply to pass the gas into the flue from an opening near the door, and to admit air by the door—the air and gas being left to mix as best they might. There are still far more boilers in this country fitted with this arrangement than with all other arrangements put together. The most usual improvement upon this method is the provision of combustion chambers in front of the boilers. Combustion chambers lose a serious amount of heat by radiation, and give the maximum temperature in the wrong place—outside the boiler instead of inside. Neither of these methods is of any use when the larger boiler outputs are required, as unburned gas appears in the waste gases as soon as the boiler load is forced. The usual efficiency of boilers fitted with these arrangements is about 55 p.ct. Sometimes it is as high as 60 p.ct., and often it is far below 50 p.ct.

Combustion arrangements have to be designed to suit three different conditions of gas pressure:

1.—Steady pressure of 1 in. water-gauge or more.
2.—Intermittent pressure, ranging constantly from 1-in. water-gauge or more to *nil*, with total stoppage of the gas flow and extinction of the flame.
3.—Very low gas pressure, or a pressure which may sometimes be high, but is low for considerable periods.

1.—For a steady gas pressure, the bunsen type of burner gives the best results. Such burners would have been generally adopted years ago but for the technical difficulties in designing them. It is easy to design the small bunsen burner used in the laboratory, but much more difficult to design burners for 80,000 or 120,000 c.ft. of gas per hour.

A good burner of this type provides its own primary air, which amounts to 60 p.ct. of the air necessary for combustion. The gas acting as an injector, draws in this air and also mixes thoroughly the air and gas before ignition takes place. Whether or not the burner is doing its duty in this respect can be tested by taking a CO_2 reading of the gas-air mixture in the burner barrel. The secondary air, which is just as essential, is drawn in by the chimney draught, in conjunction with the injector action of the mixture emerging from the burner nozzle.

The maximum flame temperature should be found in the region of the boiler within a few feet of the burner, and there should be a minimum volume of flue gases carrying away heat to the chimney. The amount of gas to be burned in a boiler is only limited by the volume of gases with which the flues can deal under the conditions of gas pressure and chimney draught. Thus the boiler output is larger than it could possibly be with a bad combustion arrangement, in addition to the efficiency being improved.

2.—It is only very recently that the problem of intermittent pressure has been solved. Burners have been developed which draw in and mix primary air with the gas in a similar manner to the bunsen burner. This form offers practically no frictional resistance to the flow of the mixture of gas and air.

It is found that this burner automatically adjusts, over considerable variations of gas pressure, the weight of primary air drawn in to the weight of gas passing, on account of the absence of friction in the mixing-tube. At one English iron-works, on a Lancashire boiler working at a gas pressure of about 1 in. water-gauge, it is found that the temperature of the waste gases is 315° C., while the temperature in neighbouring boilers fitted with the old combustion arrangement is from 700° C. to 900° C., with combustion still taking place at the dampers.

3.—To deal with gas at a very low gas pressure, and to get a good mixture of gas and air, is impossible without mechanical assistance. No burner will mix them properly. A bunsen-type burner would light-back at once at such low gas pressures. The problem can be solved in one of two ways: (*a*) Air and gas can be drawn in by means of a fan, mixed completely in the fan, and the mixture supplied to the boiler by a simple pipe; or (*b*) power to work a bunsen-type burner can be obtained by raising either the gas or the air to a sufficient pressure. The method of complete mixing is being tried in America; but the author has so far no figures for it.

If the pressure of either gas or air is raised to 2 in. or more, the conditions are then similar to those in (1), where a steady gas pressure exists. The mixing in the burner is done either by the gas or by the primary air entering under pressure; and the secondary air is drawn in at the burner nozzle as usual. To raise the gas pressure, a fan is inserted in a bye-pass on the gas-main, and three valves are provided to cut-off the fan on each side and close the gas-main when the bye-pass is open. The fan to raise the air pressure has only to deal with 60 p.ct. of the air required; but an air-main must be connected to each burner. Although these methods are costly, the results, both as to additional boiler load and as to improved efficiency, are so satisfactory as to pay many times over for the outlay.

When a short, intense flame is required, either gas or air under considerable pressure must be used. This method is well known in the case of gas-furnaces for reheating and melting. From 1½ to 2 lbs. per sq. in. pressure on the air supply is the most suitable pressure, though excellent results are obtained with 12 in. (water-gauge) pressure. The whole of the air needed for combustion is supplied by the mixing arrangement; no secondary air being used. The author believes that by this method, which puts the boiler under pressure, and by simply drawing off the products of combustion by the chimney draught, a considerable advance would be made in the direction of larger boiler outputs combined with high efficiency.

Preheated air and hot gas are of great advantage for boiler firing. Air preheated to 190° C. was used at one plant, with producer gas of 150 therms per cubic foot. The sensible heat of the air added 5 p.ct. to the calorific value of the gas, and thus raised the flame temperature.

As regards gas measurement, a rotary meter is out of the question with producer gas and blast-furnace gas, owing to the cost and to the difficulties arising from the tar and dust in the gases. In that case velocity measurements, with the assistance of the Pitot tube, or a throttling disc or an anemometer, can be taken. Velocity readings taken thus cannot be trusted to give absolute readings; but they are very effective in giving readings which are relatively correct from day to day. The author has used both Pitot tube and throttling disc gas-meters at several different plants, and on the whole has had reason to be satisfied with the readings they gave of the relative volumes. He does not know of an English make of meter working on these conditions. Before the war, he did his best to get a large English maker to manufacture these meters, and offered to lend a meter which he had found to be of the best German make, but without success.

Referring to the Bonecourt system, the author said he had had no experience of this, but pointed out that it was claimed by the makers that the heat is taken out of the gas by means of surface combustion on blocks of refractory material in the tubes, and this is transferred by means of radiation from this material. Whether or not there is any surface combustion in the process as carried on in the latest Bonecourt boilers, the author thinks it likely that the high velocity of the gases through the tubes in close contact with the walls and heating the refractory blocks may be sufficient to account for the evaporation per square foot claimed. The motion required—16 in. water-gauge—for the larger evaporations, equivalent to a velocity of about 250 ft. per second, would seem to bear this out. But, unfortunately, it was a costly matter to get these high suctions for the very large volumes of hot gas which had to be dealt with in boiler firing.

The paper concluded with some advice on boiler control, and the necessity for the employment of well-paid trained men.

DISCUSSION.

Mr. C. P. SPARKS said he had hoped the author would have paid more attention to how the gas was to be obtained, as that, to the electrical industry, was a question of fundamental importance. At present, electricity was obtained by the burning of fuel; and in the process the whole of the valuable bye-products were destroyed. It was in the national interest that this should stop. The chemical industry depended upon these bye-products; and apart from the question of the value of them, it was a physical necessity that they should no longer be destroyed. In connection with the various processes for making gas, where did the electrical industry come in? Should electric power stations be put at the coke-ovens, or should the industry work in conjunction with the gas undertakings? It was necessary to approach the question from the point of view of the engineer, of converting the heat units into electricity, and at the same time save the bye-products. Gas undertakings were usually near the centre of distribution; and interconnection between the electricity and the gas undertakings would tend to work rather on the present lines of centralization of small undertakings than in the direction of having large areas of supply.

Mr. W. B. WOODHOUSE (Yorkshire Electric Power Company) said the most important point in gas firing was the regulation of the pressure. According to the paper, producer gas, which in heat value was equivalent to blast-furnace gas, had not proved a success. It was difficult to get successful boiler firing with gas containing so much inert matter as producer gas and with such a low-flame temperature; but it could be done, and was actually being done in English works.

Mr. J. B. PATON said that the modern trend of distillation was the elimination of the hydrogen content of the gas into liquid hydrocarbon form; and he suggested that electrical engineers should consider the emissivity values of the various flames produced by the combustion of

the different gases, noting that hydrogen produced its colour in the blue zone and carbon monoxide in the red zone of the spectrum, which zone was the most efficient for radiation (heat transmission) on a radiant energy basis. As to the coal available, much of it would never be useful for anything but a preliminary distillation for oil with a subsequent distillation for gas; the coke being used in a producer for final conversion to gas. By these means it was possible to produce gas of the quality which was at present in demand by a duplicate system of gas production to be established on existing gas-works. All that was needed was combined action between the gas and the electrical industries.

Mr. H. W. KOLLE, who said he was connected with a company who had 300 or 400 boilers fired by blast-furnace gas, thought the remarks of the author were too rosy. Blast-furnace gas was a bye-product; and one of the chief difficulties was that there was great variation in the gas supply. In most blast-furnace gas there was about 30 p.ct. of combustibles mixed with 70 p ct. of non-combustibles, and a great deal of excess air was required. With gas-fired boilers, the regulation of the air was usually set once for all. Few blast-furnaces, however, had any apparatus for continuously recording the carbon monoxide in their waste gas; and it was not so easy to carry out a well-conducted efficiency test with gas-fired boilers with blast-furnace gas as some people imagined. In most cases the gas was dirty, and could not be measured through a meter, and Pitot tube reading had to be relied upon. This was a rather difficult matter, as fluctuating and varying readings were obtained. The author had spoken of constant gas pressure; but he did not think there was one installation in the country where they had any means of regulating blast-furnace gas pressure. Then there was the question of the cleanliness of the gas. It was perhaps an open question whether in practice much was gained by cleaning the gas before firing the boilers. Sensible heat was lost whether the wet or dry system was adopted. Another system was that in which the gas was used at the low pressure at which it left the blast-furnace. If gas producers were making gas solely for power purposes—which was not often the case—a regular pressure could easily be maintained; and with well designed and arranged burners a high efficiency would result. Where saturated gas was used, boiler efficiencies of 72, 73, and 74 p.ct. had been obtained. He agreed with the author that insufficient remuneration was paid at blast-furnaces and various other installations for the class of men they used for looking after the plants. There, as in electricity works, people were mean and shortsighted. In installations burning a quarter of a million tons of coal per annum they paid men £500 or £600 per annum to look after the boilers, and thought it was a big figure; but if a man were paid £1000, he would pay for himself many times over.

Mr. E. W. L. NICOL thought gaseous fuel, being an ideal one, was too good for boiler firing. The present need was for the development of coke-fired furnaces for steam generation on a large scale, and this involved the close co-operation of electricity and gas undertakings. Steam plant would have to be put down in gas-works. The problem of gas firing was a very serious one. For an electric power station of 100,000 KW., and taking the low figure of 30,000 B.Th.U. per unit generated, with producer gas at 130 B.Th.U. per cubic foot, 23 million c.ft. of gas would have to be utilized per hour; and the main necessary to transmit this quantity would have to be of the order of a "twopenny tube." He considered that the use of coal gas would also be out of the question.

Mr. W. R. COOPER thought there was no question that gas firing would come in the future. He had hoped the author would have given some efficiency results; and probably the absence of them was due to the fact that gas firing hitherto had been largely carried out with gases which were bye-products. It was necessary to know, however, the quantity of gas used, how it was measured, and its quality. Radiation was very important; but in gas-fired boilers it was lost. In the Bonecourt boiler an attempt was made to obtain radiation; and the high output per square foot of heating surface was largely due to the fact that some success had been obtained. The future must depend upon the recovery of bye-products. If the coke resulting from the gasification of coal contained a large proportion of nitrogen, and if it were burned under boilers, a valuable bye-product was lost.

Mr. W. H. PATCHELL said the more economical use of coal depended upon the cost of securing the bye-products if gas was to be adopted for boiler-firing. Coke, as such, was a bad fuel, owing to its large percentage of ash; but if it could be made use of in a gas-producer, then that would meet the needs.

Mr. J. S. HIGHFIELD said that although it appeared that the generation of electricity was the best way of turning to use the large quantities of waste gas available from coke-ovens and blast-furnaces, there was still the problem of collecting the gas to a common centre in order to turn out electricity in large quantities. The difficulty was to get figures to show how it would pay to do it. From figures he had obtained, it did not appear that the present financial position of generating electricity by burning coal would be improved, even after taking into account the revenue from the bye-products.

Mr. A. H. DYKES said the whole future of electricity supply depended upon the utilization of gas power for boiler firing; and it was a matter which would have to be settled by electrical engineers in conjunction with chemists and metallurgists, as the future electric power station would be a combination of a chemical-works and a generating station. He hoped those who had had actual experience of gas-fired boilers would come forward with figures of costs and efficiencies, particulars of the types of boilers used, and what modification had been made in the boilers. He particularly would like to see figures as to the difference in cost of boiler upkeep with gas and with coal firing.

Mr. C. P. TAYLOR pointed out that if increase in the price of coal continued, it would be less advantageous to adopt gas firing unless the price of sulphate of ammonia went up proportionately. He had recently had to look into a small proposition for power distribution, and had come to the conclusion, although it was heresy, that it was difficult to justify the use of electricity, and that gas could be utilized more cheaply in the case in question.

Mr. LL. B. ATKINSON said he had had some disastrous experience with gas firing a few years ago. Many of the speakers were basing their hopes on the return from sulphate of ammonia; and in doing this they were making a great mistake. As a matter of fact, not only were the bye-products which were likely to be most useful to the country after the war—oils and chemicals of that type—but the electrical engineers, by their attempts to develop the manufacture of nitrogen from the air for agricultural purposes, were doing their best to destroy the market for high-priced sulphate of ammonia.

Mr. HUNTER, in his remarks, said he had purposely kept away in the paper from the manufacture of gas, which was an immense subject. He had not put efficiency figures in the paper because results with gas-firing were very difficult to substantiate. But using water-tube and Lancashire boilers he should hope to get a working efficiency of 85 p.ct. with coke-oven gas firing, and about 80 p.ct. with clean blast-furnace gas and producer gas. He doubted whether the efficiency of the Bonecourt boilers was due specially to the radiation of heat from the fuel. It seemed to him that the tremendous velocity with which the gases were passing through small tubes was sufficient to account for the transmission of heat—of course, partly aided by the radiation.

RECENT DEVELOPMENTS IN BYE-PRODUCT COKING.

At last week's meeting of the Institution of Civil Engineers, a paper on this subject was read by Mr. GEO. B. WALKER, of Tankersley Grange, near Barnsley. The official abstract of it, as issued by the Institution, is as follows.

The paper is supplementary to one written by the author in 1900, when coke-ovens of the retort type were little in use in this country. Since then a revolution has taken place in the system of coking; and large numbers of plants of ovens of the retort type with recovery of bye-products are in existence, and are being constantly added to. The war has stimulated the demand for hydrocarbon explosives; and these are now commandeered by the Government—coking plants being under the control of the Ministry of Munitions.

Although the principle of external heating of the retort oven (originally introduced by Evence Coppée) remains the same, considerable modifications in detail have been gradually introduced by various builders, as the result of experience. The object of these modifications has been chiefly to increase the rapidity of the coking process by the application of more intense heat, and by the heating of the air for combustion. Convenience and economy in operation have also received a good deal of attention. The recovery of bye-products has been greatly developed; and, in particular, many experiments with more or less success have been made for achieving the direct recovery of sulphate of ammonia. One of the most important developments has been the utilization of the surplus gases in internal combustion engines, and for town illumination, metallurgical furnaces, and other manufacturing purposes.

The author described the principal features of half-a-dozen of the most successful types of oven in use in this country and the recovery-plants associated with them, and cited figures showing the economies obtained by the direct recovery of sulphate of ammonia, here and in Germany. He also compared the relative value of the surplus gases used in producing steam (utilized through turbines) and in internal combustion engines, to the advantage of the latter.

SIMPLE APPARATUS FOR WASHING GASES.

A simple apparatus for the washing of gases is described by Mr. Harold H. Gray, in the "Transactions of the Chemical Society." It appears that while engaged in investigations regarding the extraction of hydrocarbon vapours from a mixture of gases containing them, the difficulty of securing a suitable gas-washing apparatus caused much inconvenience and some delay. Such a determination as that of the amount of toluene or xylene present in coal gas, carburetted water gas, or similar gaseous mixtures usually involves the operations of (1) washing the gas by means of a suitable solvent, and (2) distilling and fractionating the solution so obtained in accordance with a scheme of operations similar to that drawn up by Dr. H. G. Colman or by Mr. James Little trouble arises under heading (2), owing to the care with which the details have been worked out; but the washing of gas in such a way as to obtain accurate results may cause trouble. The author experienced much difficulty in putting together an apparatus which would give reasonably accurate results, and at the same time not require constant attention. Assuming that a satisfactory estimation requires the collected vapours from about 100 c.ft. of gas (2800 litres), various experimental difficulties are liable to occur.

No washing apparatus was known to the author which would wash quickly 2800 litres of gas without the development of very considerable back-pressure. Mechanical distributing devices, either for the gas or the oil, failed to realize the hopes placed in them, and in no way destroyed the difficulty of back-pressure. Accordingly, the gas to be washed was passed through a mass of condensing vapour. As it was desired to extract toluene from coal gas, the first vapour to be tried as a solvent was the vapour of benzene.

The gas to be treated is led through a glass tube, which is arranged concentrically throughout the length of the inner tube of

a water-cooled Liebig condenser—the end of the first tube projecting into a flask. The flask contains the solvent, which, in the case of toluene estimations, may suitably be heated benzene (of a known boiling-point range). The gas, now heavily laden with benzene or other vapour, passes out of the flask into the annular space in the inner tube of the Liebig condenser. It there deposits benzene in the form of mist. The benzene fog or mist washes out toluene and allied vapours; and the gas, now saturated with benzene vapour, passes out of the condenser by a side-tube. The final mixture of toluene and benzene which remains in the flask is subjected to fractionation in the usual manner. The necessary joints can be made quite satisfactorily by means of good bark corks. Mercury cup-joints are less subject to leakage, but are expensive and difficult to repair. A few trials made it clear that the "vapour" washer, under suitable conditions, possessed many advantages over "liquid" washers; and by its use the author succeeded in eliminating (or at least greatly reducing) drawbacks attaching to the use of liquid in a gas-washing apparatus.

The efficiency of extraction is due mainly to the ideally intimate contact between the gas and the washing medium. The drenching of the gas by means of the precipitating liquid compares very favourably with the more gross and less intimate washing which occurs when gas is simply bubbled through liquid. Another important factor is that the solvent is continually present in large excess, and in a pure form. A catch-bottle placed after a series of three vapour washers was found to contain pure benzene of the same boiling-point range as that originally employed. This may be taken as an indication of complete extraction.

The choice of benzene as solvent for toluene was based on the fact that at the ordinary temperature the vapour tension of benzene is greater than that of toluene. If one expresses this in another way, by saying that the benzene has a greater tendency to enter the gas than has toluene in similar circumstances, it will readily be seen that benzene is a more suitable solvent for toluene than is such a substance as "green oil," since it is conceivable that at certain concentrations, easily attained in a gas-washing apparatus, the toluene is more likely to be given up to the gas than to be retained by the "green oil." The danger of over-saturation of the solvent is rather remote when benzene is used to dissolve toluene. Similar considerations arise in the converse operation known as "carburetting" gases of poor calorific or illuminating value on a large scale. The examination of liquid deposits in gas-mains indicates clearly that the use of heterogeneous carburetting liquids is not always economical in practice, however cheap such liquids may be, and can seldom fail to lead to erratic results. Other conditions being equal, if two liquids are to be examined with a view to their use as carburetting agents, the liquid with the narrower boiling-point range should give the most constant results.

Apart from the relative vapour tensions of the solvent and the solute, the suitability of a solvent will be determined by the behaviour during subsequent distillation of the solution obtained. A separation is essential. The form of apparatus explained demands the use of a solvent of higher vapour tension than that possessed by the vapour to be extracted. There seems, however, to be no reason why a xylene mist should not extract toluene in a suitably designed washer. The condenser would not then be of the reflux form, nor would the solutions so obtained be of any great degree of concentration.

The velocity of gas flow with which it is convenient to work will depend largely on the areas of cross-section of the various portions of the apparatus. When a glass tube of 0·6 cm. internal diameter was used, it was possible to wash the gas at the rate of 280 litres per hour, which is an improvement on the usual rate of 42 litres per hour employed when washing coal gas with oil in the liquid form. Wider tubes would allow of still more rapid washing.

The "vapour" washer is capable of general application in the examination of mixtures of permanent gases with vapours, provided that for each case a suitable solvent is found. The use of vapour seems well adapted to the determinations of dust or tar fog in gases, determinations which are frequently required, but are really difficult to carry out in a truly satisfactory manner. Wherever it is desired to extract soluble vapours with maximum efficiency from a large quantity of gas in minimum time, the use of vapour would seem to promise many advantages over the usual forms of "liquid" washers—such as washing towers, spirals, worms, bead-washers, &c.—all of which have the common drawback of interposing a considerable amount of resistance to the passage of gas.

Utilization of Energy.—Lecturing at Keighley recently, upon "Our Sources of Energy and Some Possibilities in Connection with their Full Utilization," Prof. Watkinson, of Liverpool University, said that by a proper scheme of electrical distribution by plants concentrated at the coal-fields under Government control, bye-products could be procured; and from the present amount of coal burnt they ought to get 200 million tons of tar, from which could be secured about 8 million tons of tar oil suitable for engines. This quantity was equal to four times its weight of coal, and would be more than sufficient to drive all the British Navy and the mercantile marine. Benzol and ammonia would both be recovered, if the coal were properly gasified; and sulphate of ammonia would be produced for manure.

THE LIGHTING OF SCHOOLS.

In order to render available authoritative information for those concerned with the lighting of schools, a practical code has been drawn up by Committees of the American Illuminating Engineering Society, who, as showing the urgent need for something of the kind, point to the fact that out of 20 million school children in the United States, nearly 10 p.ct. of the number examined are found to have defective vision.

Both natural and artificial lighting are dealt with, and figures of minimum and desirable illumination are given. The need, except in very rare instances, of having lights adequately shaded or completely hidden is emphasized; and it is recommended that lighting units be of low brightness, even if they are located high in the field of view. It is suggested that preferably a unit should not exceed 250 millilamberts. A millilambert is equal to the brightness of a perfectly reflecting and diffusing surface illuminated to an intensity of 0·929 foot candle (0·929 lumen per square foot). In the normal visual field, the darkest part of the working space should have a brightness not less than one-twentieth of that of the brightest part. Glossy surfaces of paper, walls, &c., are likely to cause eye-strain, because of specular or mirror-like reflection of images of light sources, especially when artificial light is used. Matte or dull-finished surfaces are therefore recommended. A high reflection factor does not necessarily imply a polished or glazed surface.

Photographs are reproduced of installations of good direct, indirect, and semi-indirect lighting, as well as of some examples of bad lighting—the undesirable features of which are pointed out. The authors state that illumination intensity on the horizontal working plane should be as uniform as possible—the variation should not be greater than four to one. This ratio refers to the light received by the object illuminated, and should not be confused with the ratio of twenty to one for brightness contrast, which refers to the light radiated by the object. A blackboard and a white sheet of paper on it may receive the same amount of light; but the latter will reflect much more light than the former—thus causing a marked brightness contrast between the two surfaces. In fact, blackboards should be of the minimum size practicable, and the surface as dull as possible. Further, they should not be placed on a white or highly reflecting wall. A method is shown of computing the total lumens required to give a certain illumination intensity in foot-candles; and it is remarked that, with the usual lighting equipments, the distance between the units should not exceed one-and-a-half times the height of the apparent source of illumination above the working level. Systematic maintenance is important, to provide against depreciation in illumination intensity due to broken mantles, accumulations of dirt upon the lamps, &c., as it is found that carelessness in this respect may easily reduce the effective illumination by 50 p.ct., especially in indirect and semi-indirect lighting.

The present is the first edition of this Code of Lighting School Buildings; and it has been sent out from the offices of the Illuminating Engineering Society, No. 29, West Thirty-Ninth Street, New York, in the hope of receiving criticisms, suggestions for revision, additions, or omissions.

Houses Heated Entirely by Gas.

Describing in the "American Gas Engineering Journal" last winter's experience in the case of 500 or more houses in Baltimore which were entirely heated by gas, Mr. E. D. Milener, of the Consolidated Gas Company of Baltimore, says the Company have now recommended the entire elimination of coal from cellars. Last winter there were a number of boilers and furnaces connected in tandem, with the idea of using coal when the severe weather came, and employing gas during the moderate season. However, at the end of the winter it was found that not a ton of coal had been used in any of the houses; and the conclusion come to was that a man who could afford to put in gas wanted to absolutely eliminate the coal equipment and enjoy gas the whole season, and not be jumping first to one and then to the other. Even with gas at 35 c. per 1000 c.ft., and coal at $8 to $8.50 a ton, Mr. Milener says the average fuel cost of heating an entire house with gas will be at least 25 p.ct. more than with coal; and to keep this difference from being greater, it is necessary that the best equipment only be used, and to work this equipment in a sensible manner. After emphasizing the main features which should be included in a central gas heating plant, he expresses the opinion that it is absolutely necessary for the gas company to maintain supervision over all such apparatus. If burners, cut-off valves, thermostats, &c., are not adjusted properly, the bills will run too high, the service will be unsatisfactory, and the customer will become dissatisfied. In the case of Baltimore, every detail of the plant is first inspected and adjusted, and its operation fully explained to the customer; and after this monthly inspections are made, in order to keep every part of the equipment in first-class condition.

A visit will be paid next Saturday afternoon by members of the Scottish Junior Gas Association (Eastern District) to the gas-meter testing station at Edinburgh, and the Gas Commissioners' model show-rooms.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Neath Gas Stokers' Strike.

SIR,—I notice in this week's "JOURNAL" there is a letter signed "Another Local Correspondent," in which an attempt is made to discredit the work of myself and staff during the recent strike at the Neath Gas-Works. It appears to be a great thorn in the flesh to "Another Local Correspondent" that I was able to keep up the gas supply to the town and district, instead of as in the previous strike in November, 1914, when the gas supply failed within 14 hours of the workmen ceasing work. In this particular instance, the men finished work on the Saturday at one o'clock p.m., and did not return until 10 o'clock p.m. on the following Wednesday evening, which is rather longer than your correspondent's "three days." Although the carburetted water-gas operator was on strike like the other workmen, the carburetted water-gas plant was kept at work throughout. Seeing how munition works are depending so much upon gas for keeping up their supplies, it seems to me a pity that "Another Local Correspondent" should put forth his petty spite in trying to discredit the loyalty and hard work on the part of those who managed to keep the gas-works, and incidentally the local munition works, going during the strike period.

Your correspondent wilfully tries to mislead when he states that no such communication as you printed in your previous issue (p. 335) was published in the local Press. The report was published in several of the local papers, one of which I enclose for your inspection.

I regret having to take up your valuable time in contradicting such a garbled and misleading letter as was sent by "Another Local Correspondent;" but I feel compelled to do so, in fairness to the members of my staff, who worked so loyally and well during the strike. Perhaps "Another Local Correspondent" will be good enough to give his name should he think further to report upon Neath gas affairs.

WM. JACKSON, Engineer and Manager.

Corporation Gas Department, Neath,
Dec. 8, 1917.

Low-Temperature Carbonization.

SIR,—I should like space in your next issue to reply to Mr. F. D. Marshall's letter.

I do not understand his "slang word" as applied to me. I have asked two friends its meaning; and they fail to enlighten me.

Mr. Marshall then says that I declined to be drawn into a discussion on the merits or demerits of high and low temperature carbonization. I have not done anything of the kind; the contrary being the real fact. Mr. Marshall wanted me to discuss and define a line between high and low temperatures. I declined, but said that everything depends upon the necessary and suitable heat being applied for the various objects for which the carbonization of coals is required; and to this I adhere.

I then asked him (so that we might start fairly) to furnish me with the analysis of the Kent coals he had been testing, the same as I had previously done; also that he should submit figures showing the commercial advantages of his system, so that the working results would enable us to judge of their merits.

I think, Sir, your readers will at once see that it is Mr. Marshall who has "thrown up the sponge," by declining to discuss and answer the very proper questions I asked him.

As to his talk about merits or demerits, I think that I have pointed out very clearly, and also given most definite figures as to, the great advantages and merits there are in high-temperature carbonization, which I have strongly advised the gas industry (when practicable) to carry out, so as to obtain the largest volume of gas possible out of its coals. I have also given some definite examples as to how to extract more tar and sulphate of ammonia from the coal, so that it will enable the gas industry to supply cheaper gas for light, heat, and power purposes. I have also pointed out very plainly what I consider are the chief demerits of the low-temperature carbonizing system; and to what I have said I shall strongly adhere until I see some positive and reliable commercial statements to the contrary. Inasmuch, too, as some of the low-temperature carbonizing companies have been in operation for about fifteen years, spending huge sums of money obtained chiefly from the public, I am strongly of opinion it is quite time they published some proper and dependable statement of accounts to justify their existence.

Mr. Marshall has given us (I believe for the first time) an illustration in the "JOURNAL" of his views and aims in a more detailed form than any of the low-temperature carbonizers have done heretofore; and for this I thank him. Then he goes on to relegate us into two separate and distinct camps. I also like these statements. Following on, he says that the objects and aims are totally different from each other; and this is very evident when you consider the fact that I strongly recommended a carbonizing temperature for gas-works of about 2500° Fahr., while he advocates from 900° to 1200° Fahr. for securing his coke or coalite, and other products. I believe in securing a very large volume of gas for sale; but he says the last thing sought for by low temperatures is gas, and that, after he has heated his retorts, anyone may have the rest.

Mr. Marshall believes in going to the trouble, expense, and labour of putting coal into his retorts, and only extracting about two-thirds of the volatile matter out of it—leaving the other one-third of this valuable matter in the soft and friable coke, which coke is chiefly used for domestic purposes. I consider this a great waste and loss to the nation of most precious material, as the waste gets away up the chimney and pollutes the atmosphere. The question I should like to ask Mr. Marshall is, Why, as these products are so valuable, he does not extract more of them from the coal? I suggest that the probable longer time it would take to carbonize the coal prevents it being a profitable procedure.

It appears to me that, if Mr. Marshall with his low temperatures can afford to dispense with the sale or use of his gas beyond heating his retorts, and to leave about one-third of the volatile matter in the coke, he will have some difficulty in making a satisfactory dividend with what is left for him to work upon.

Mr. Marshall has endeavoured to show and define that there must be one special system of high temperatures for gas undertakings, and another system of low temperatures (to which he is allied) for the production of his coke and bye-products. I have no objection whatever to this. My chief contention is that I believe it is not wise or profitable to unduly interfere with the customary routine of a gas-works, and certainly not by introducing any system of low-temperature carbonization. If special products are required for war or other purposes bevond what are being obtained at the present time in gas-works, I am satisfied that the best way to secure them is by special means, and at the necessary temperatures most suitable for securing them.

Mr. Marshall refers me to a lecture he gave at Manchester to the junior gas engineers. He told them that "he saw through a glass darkly," and he confesses "he does not see any clearer now." I can quite believe him; and I am afraid I cannot help him out of his dilemma. He also states that he has established another industry; and finally he says that whether the ideals will ever be obtained rests in the "lap of the gods." That he has shown pluck, skill, and enterprise, no one will dispute; and we had better leave him to go on fighting his battles, as there is certainly room for us all to display our talents. But, for my own part, I intend to stick to the good old ship, singing "Excelsior."

JOHN WEST.

Southport, Dec. 8, 1917.

Steaming and Blue Water Gas in Verticals.

SIR,—The great philosopher Aristotle, in one of his works, said that "intellect is perfected not by knowledge but by activity, and that the arts and sciences are powers which exist only for the sake of action." Even the profoundest thinkers of modern times testify to the same great principle that the pleasure of philosophy is the "Search after Truth."

So far as the science of gas practice is concerned—more particularly during the last decade—there has been, and I hope still will be, plenty of activity.

Considered from the philosophic point of view, it behoves us all to stimulate our intellect by the pursuit of knowledge of the most scientific and economic methods of every branch of our work—ever keeping in mind the motto to "Search after Truth."

I think I may be privileged to add a little to the philosophic aim, by saying not only search after truth but give it to others as you find it, in detail, so that fair deductions and comparisons can be made of either individual or competitive systems.

I was very pleased to read Mr. West's remarks; and I quite agree that questions relating to the economics of our business should not be left altogether to the "veteran engineer." But so long as Mr. West is able (and I am sure we all hope he will be long spared) to give to the industry the value of his resources and his wide experience, he is not only showing, particularly to us young engineers, the benefit of the perfection of knowledge by activity, but assiduousness that is worthy of the highest praise and emulation.

Now, just turning to the subject referred to in Mr. West's letter, I do not doubt for one minute that the coals referred to cannot be carbonized. By reference to slack, I presume Mr. West means washed slack or coals that would not pass a ¾ in. sieve. It is possible to carbonize slack of this description in any vertical retort or to carbonize even finer slack; but the point is—Does it pay to use a vertical retort for the purpose?

If a retort is designed for a throughput of (say) 4½ tons, and the quantity due to physical characteristics is reduced to 2½ tons, on a working capacity of thirty-two retorts the "coal figures would be 144 tons and 80 tons respectively, which means that at 2½ tons there would be required twenty-six retorts more, which is a very serious question from a financial point of view.

The question of fuel consumption also deserves attention. Mr. Blundell gives a figure of 11·5 lbs. of coke per 100 lbs. of coal, which is very reasonable. When it comes to a question of the carbonization of thousands of tons of coal per annum and the use of additional settings due to reduced throughput for a definite quantity of gas, and with coke at (say) £1 a ton, meaning £90 per 100 tons of coke (an additional 9 lbs. of coke per 100 lbs. of coal), the increased expenditure in a considerable item. Although such coals may be worked, I consider it very questionable whether it is worth the expense.

With regard to your own remarks, *re* tar and its disposal to the distiller, I was so absorbed over the vertical retort papers that I had omitted to read the report of the National Gas Council. However, I am glad that steps are being taken to put the matter on a firmer basis, so that our suspicions may be allayed.

GEO. H. ELLIOTT.

Portsmouth, Dec. 8, 1917.

Decimal Coinage and the Prepayment Meter.

SIR,—I have noted your editorial comment on the above matter in your issue of the 20th ult., and hope you will find space for the following notes thereon.

In the first place, you will observe from the enclosed circular that the sixpenny piece could be *exactly*, and not approximately, expressed as 25 mils, since its relation with the monetary unit—viz., the pound sterling—remains unchanged. The sixpenny piece is now one-fortieth part of a pound, and as a coin representing 25 mils or ¼-florin, it would remain one-fortieth of a pound.

It is true that our present coins of lower value than the sixpenny piece would require modification, due to the fact that the present penny is not a decimal sub-multiple of the pound. This would necessarily

result in slight adjustments in the quantity of gas now referred to as a pennyworth. The gas companies would presumably arrange to supply either slightly less gas for the 4-mil piece, or more gas for the 5-mil piece; and the present period of fluctuating cost is obviously a most suitable time for making the change.

E. Merry, Acting Secretary.
The Decimal Association.

Finsbury Court, Finsbury Pavement, E.C.,
Dec. 4, 1917.

[Our correspondent does not deal with our comment as to the prepayment meter mechanisms being arranged for coins of the size of the penny, and the proposal as to the use of nickel for the 5-mil piece.—Ed. "G. J."]

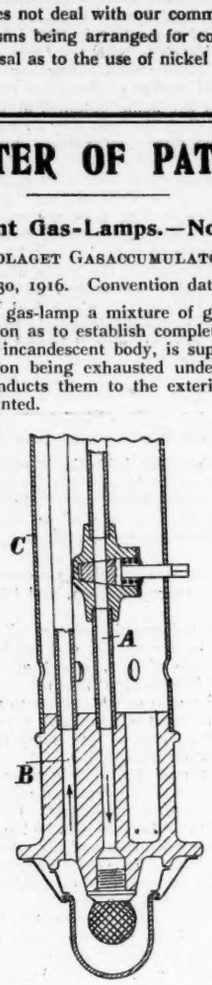
REGISTER OF PATENTS.

Incandescent Gas-Lamps.—No. 102,373.

Svenska Aktiebolaget Gasaccumulator, of Stockholm.

No. 15,458; Oct. 30, 1916. Convention date, Nov. 20, 1915.

In this incandescent gas-lamp a mixture of gas and air, in such a predetermined proportion as to establish complete combustion both in the burner and at the incandescent body, is supplied under pressure; the gases of combustion being exhausted under pressure through a similar pipe which conducts them to the exterior of the chamber in which the lamp is mounted.



A Swedish Incandescent Gas-Lamp.

In the lamp casing is arranged a supply pipe A for the gas and air mixture—the air in such proportion as to burn with a blue flame in the burner opening as usual. As the mixture contains air in excess, the combustion on the surface of the incandescent body is also effected, and it is not necessary to supply additional air "as hitherto is usually the case." At the end of the casing, the burner and holder for the incandescent mantle are provided as usual. Surrounding the mantle is a globe, which is hermetically fixed to the lamp casing, in which is arranged an outlet pipe B leading to the atmosphere. Through the outlet casing C air may be led if desired.

The patentees point out that no additional air is supplied either to the burner or to the mantle, but the whole quantity of air necessary to obtain complete combustion both in the burner and mantle is present in the gas and air mixture, supplied through A. As the globe is hermetically closed, a pressure above that of the atmosphere prevails in the interior of it, so that the gases of combustion are forced out against the pressure of the atmosphere through the pipe B, and are thus still under pressure. The lamp therefore needs only a supply pipe for the gas and air mixture, and an outlet pipe B for the gases of combustion.

Gas Furnaces of the Crucible Type.—No. 109,586.

Richmond Gas Stove and Meter Company, Ltd., and Hartley, H., of Warrington.

No. 5336; April 16, 1917.

This invention, referring to furnaces of the crucible type heated by gas, comprises (in combination) at the front portion a crucible chamber, a metal or substance preheating chamber within the furnace, and an air-heating chamber—both the latter being heated by the waste gasses of combustion which pass through them. A metal or substance pre-heating chamber is above, and a passage communicates between the crucible chamber and the preheating chamber. There is a removable bottom portion adapted to be passed through the lower bed plate or fittings; while the furnace has its main parts arranged to effectively carry out the inventors' idea.

Introducing Combustion Gases into the Heating Flues of Coke-Ovens or Other Gas-Heated Furnaces.—No. 109,752.

Bagley, D. & E. A., of Victoria Street, S.W.

No. 5920; April 26, 1917.

This invention relates to the control of the combustion gases supplied to the horizontal heating flues of rectangular coke-ovens or gas-heated furnaces, in order to prevent the juncture of the air and gases before admission to the heating flues. The invention also permits the employment of gas or air under pressure, or, individually under widely divergent pressures, by employing vitreous conduits for the gases for combustion impermeable to either gases or air, and protecting them from devitrefication or failure by cracking or breakage, while allowing for the expansion or contraction of the conduits due to alterations of temperature, and a means of controlling the temperatures of each individual heating flue.

Thus, the position of the air-conduit may be determined irrespectively of the vitreous gas-conduits; for the union of the gas and air before admission to the heating flues is rendered impossible by the employment of conduits which are impermeable to either gases or air, while this condition is secured independently of the pressure in either the gas or air conduit.

The employment of gases or air for combustion under variable or differing pressures is, the patentees point out, important in securing the uniform heating of the side walls of coke-ovens. Hitherto when using rich gases at or about atmospheric pressure, the greatest heat is developed in the combustion zone in the lower section of the flues of vertical flued ovens, leading to more intensive heating of the lower portion of the side walls than the upper; and the carbonization of the coal charge is, consequently, completed in the lower portion of the chamber before the upper portion—leading both to loss of bye-products, wastage of combustion gases, and increasing the period of time occupied in coking the full charge. When the gases are introduced under pressure, the length of the flame and the actual zone of combustion may be increased—in this way avoiding the intense heating of the lower portion of the side walls and (in contradistinction) extending the even distribution of heat from the bottom to the top of the side walls, permitting simultaneous carbonization of the whole of the coal charge contained in the oven, while the height of the oven chamber may be sensibly increased.

Another important feature rendered permissible by the ability to employ gases or air for combustion under variable or differing pressures is that, without any alteration to the flues or conduits, a lean gas low in hydrogen (such as producer, or blast-furnace gas) may be utilized at will, or any desirable mixture thereof containing, or free from, the coal gases distilled from the coal charge ordinarily used for fuel purposes for the heating of coke-ovens or the like.

Gas-Fires.—No. 110,455.

Thornton, A. A.; a communication from the Thermophore Manufacturing Company, of Kalamazoo, Michigan, and A. E. Dieterich, of Washington.

No. 154; Jan. 3, 1917.

This invention has for its primary object to provide apparatus in which the generated heat units are given off principally by radiation, directly into the room; the heating elements being so designed as to give off the maximum quantity of heat units by radiation and only a relatively small amount by convection; while the parts are so designed as to reduce the flue waste of heat to the minimum. The invention also provides a special construction of heating element on which the incandescent member is protected by a perforated envelope—the two being so designed that the incandescent member becomes uniformly luminous throughout its length, and thereby adds to the efficiency of the apparatus.

Gas-Burners for Metallurgical and Other Furnaces. No. 110,960.

Yates, H. James, of Birmingham, and Brayshaw, S. N. & E. R., of Hulme, Manchester.

No. 16,662; Nov. 21, 1916.

This invention is designed to provide a burner to work with gas at normal pressure and with air at a pressure of only a few inches head of water, though it may be used with gas or air at higher pressures.

The parts of the burner comprise a combustion chamber of approximately L shape, the transverse branch entering the furnace (and preferably flaring or of fan-shape); a gas-nozzle connected direct with the gas-supply pipe entering the longitudinal branch of the combustion chamber at right angles to its longitudinal axis, and an air supply pipe entering at one end of the longitudinal branch of the combustion chamber, and co-axial therewith, to direct a jet of air across the end of the gas-nozzle and carrying the mixed air and gas to the transverse branch where ignition takes place—the flared or inclined sides permitting the flame to spread laterally as it enters the furnace.

The invention is fully described with reference to six sheets of lettered drawings showing the arrangement applied to a furnace for heating or hardening tools of high-speed steel.

Anemometers.—No. 111,015.

South Metropolitan Gas Company, Evans, E. V., and Thomas, J. S. G., of 709, Old Kent Road, S.E.

No. 2383; Feb. 17, 1917.

The cooling effect of a current of air, the patentees point out, varies with the speed of the current; so that variations in the elec-

trical resistance of a hot wire placed in the path of the air indicate variations in the speed. Anemometers operating on this principle are known; but "as hitherto constructed they are not applicable to elastic fluids in general." Thus, in the case of gases which are easily decomposed by the red-hot wire—generally a platinum wire—or of gases which attack the wire, or deposit upon it soot or carbon from decomposed hydrocarbons, the indications afforded by the variations in the electrical resistance do not long remain [illegible]thy.

The improvements which form the subject-matter of the present invention include the sealing on to the wire of a suitable non-conductor of electricity; it having been found that when the wire is coated with, or closely surrounded by, such a non-conductor, it is still sufficiently sensitive in respect of its varying resistance under the cooling effect of the elastic fluid to serve the purpose in view. Glass or silica is a suitable electrical non-conductor for enclosing or coating a platinum wire; and the improvement effected is that the wire is not in contact with the gas or gases—for instance, coal gas or flue gases—so that the indications are not disturbed by deposits upon it or by chemical attack of it.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 5.]

Nos. 17,382—17,825.

ATKINSON, E. J.—"Gas-containers for motor vehicles." No. 17,646.
ATTREE, T. J.—"Securing constant proportional mixture of gas and air." No. 17,604.
BAMBER, H. W.—"Producer-gas plants." No. 17,740.
CHERRY, C. E.—"Storing gas for internal-combustion engines." No. 17,633.
CROUCH, R. J. G.—"Motor-cars, &c., driven by gas." No. 17,657.
DOCKING, A.—"Gas-heated irons." No. 17,649.
DRAKE, W. A., & DRAKES, LTD.—"Apparatus for charging retorts, &c." No. 17,489.
DRYBROUGH, W. C.—"Attachment for gas-containers." No. 17,691.
GREENE, S. H.—"Gas-containers." No. 17,618.
HARDING, W. F. S.—"Gas bags or containers." No. 17,634.
HARGER, J.—"Manufacture of hydrogen and ammonia." No. 17,563.
KINNARD, E. H.—"Gas-container." No. 17,659.
LINDSAY LIGHT COMPANY.—"Recovering thorium from monazite sands." No. 17,468.
MOODY, A. R.—"Storing coal gas for use in engines." No. 17,472.
MURDOCH, D.—"Gas-burner for lighting fires." No. 17,653.
PARKER, C. H.—"Motor vehicles driven by gas." No. 17,558.
RATHBAND, J. R.—See Murdoch. No. 17,653.
ROEBUCK, J. W.—"Supply of gaseous fuel to engines." No 17,429.
SHARP & PRESTON.—See Docking. No. 17,649.
STEVENSON, A. H.—"Boxes for mantles." No. 17,710.
THOMPSON, H. G.—See Stevenson. No. 17,710.
TOWNSEND, W. W.—"Method of producing mixed coal gas and water gas." No. 17,392.
WHITFIELD, C.—"Automatic gas regulators." No. 17,641.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Control of Mines and Train Mileage.

Colonel F. HALL asked the President of the Board of Trade how, consequent on having control of the output of mines, the 700,000,000 ton-miles estimated by the Coal Controller were going to be saved; how the figure was arrived at; whether all the railway companies interested in the scheme were consulted; and what did the alleged saving of 700,000,000 ton-miles represent in train-miles.

Mr. WARDLE, the Parliamentary Secretary to the Board of Trade, in replying, said the saving in haulage was effected under the operation of the Coal Transport Reorganization Scheme, the object of which is to secure the consumption of coal as near as possible to the point of production. The figure of 700,000,000 ton-miles was based on the tonnages of coal affected in each of the colliery districts, and the reduction in haulage secured by the transfer of these tonnages from one district to another. The railway companies chiefly concerned were consulted as regards the effect of the scheme on the working of their systems. Estimates which had since been prepared by certain of the railway companies of the saving actually effected tended to confirm the original estimated saving for the country as a whole. As regarded the last part of the question, a trainload was a variable quantity; but the figure of 700,000,000 ton-miles might be taken to correspond roughly to 2,000,000 train-miles, apart from the haulage of the empty wagons back to the collieries.

Mr. WING asked if there had been any real advantage to any part of the country arising from this.

Mr. WARDLE replied that there had been very great advantage.

Colonel HALL asked if it was not a fact that the railway companies are complaining of the great dislocation in consequence of the manner in which this matter had been handled by the Board of Trade.

Mr. WARDLE replied that no complaints had reached him.

Port Ellesmere Indigo Works.

Mr. WRIGHT asked the President of the Board of Trade whether the indigo works at Port Ellesmere had been sold or leased by the Government to Messrs. Levinstein; if British Dyes, Ltd. (a Company formed under Government auspices for the purpose of manufacturing indigo and other dyes) were allowed to make a competitive tender for the purchase of these works; and, if not, would he explain why this course was not adopted.

Mr. WARDLE referred to the answer given by the late President of the Board on Oct. 19, 1916 (see "JOURNAL," Oct. 24, 1916, p. 189).

Filling Gas-bags to Motor-Cars.

Mr. GEORGE LAMBERT asked the Minister of National Service whether men now engaged in filling gas-bags to private pleasure motor-cars could be engaged on work of more national importance; and whether any action had been taken.

Sir A. GEDDES replied that the questions involved in the use of gas-bags were being considered.

Alliance and Dublin Gas Company's New Powers Bill.

The Alliance and Dublin Consumers' Gas Company propose to promote a Bill giving the following, among other, powers: The repeal, alteration, or amendment, temporarily or otherwise, of all or any of the Acts relating to the Company respecting the sliding-scale of price and dividend; charging for gas as deemed necessary or expedient; the holding of the ordinary meeting annually instead of half yearly; and the payment of interim dividend without the sanction of a general meeting.

LEGAL INTELLIGENCE.

PREFERENTIAL CHARGES FOR ELECTRICITY.

APPEAL AGAINST THE HACKNEY JUDGMENT.

The Attorney-General (at the Relation of the Gas Light and Coke Company) v. The Metropolitan Borough of Hackney.

(*Before Lord Justice* SWINFEN EADY, *Lord Justice* WARRINGTON, *and Lord Justice* SCRUTTON.)

Thursday, Dec. 6.

The hearing of the appeal against the decision of Mr. Justice Astbury in regard to the alleged preferential charges for electricity by the Metropolitan Borough of Hackney (a report of the first two days' proceedings in which appeared in the "JOURNAL" last week, pp. 470-1) was resumed to-day in the Court of Appeal of the Supreme Court of Judicature.

Mr. A. J. WALTER, K.C., continuing his argument on behalf of the respondents, said it had been argued that the Long Eaton case decided that as between power consumers one could not be charged less per unit if he took light as well as power. But to state it thus was to miss the whole point, and to use words without considering what they meant. In the Long Eaton case, a power user who took light made his load factor worse; and yet he was charged less per unit, though the station was worse off by taking light, as the plant was used less hours each quarter. In Hackney, a light user who for each unit he used for light had, under the scale, greatly improved the load factor and benefited the station more hours each quarter, was charged less for his total supply than was charged to a light user.

Lord Justice WARRINGTON: It comes to this, that light *plus* power is a better customer than power.

Lord Justice SWINFEN EADY: Because his load factor is worse.

Mr. WALTER: Quite so; and it is automatically fixed. The phrase *quâ* light and *quâ* power was totally misleading as applied to Hackney. No one could take a mere light supply under the scale—he could not get any units for light unless he used four times as much for power. It followed automatically, under the demand system of payment, that any improvement of the customer's load factor cheapened the cost per unit, and any falling off of the load factor made the cost per unit higher. His contention was that respondents were directly within the section of the Electric Lighting Act which entitled them to differentiate between different customers; and this was why when one said *quâ* power or *quâ* light he confused the issue. A customer could not get energy for light without taking four units for power, as it was "20 p.ct. of the energy consumed." The station was entitled to distinguish between customers who were better for them; and the appellants' own case was that respondents were entitled to treat a customer better who took electricity for power as well as light, and therefore they were entitled to treat customers in a different manner. Having called attention to portions of the evidence and the Long Eaton case, Counsel submitted that it was a direct authority in his favour.

Mr. COLEFAX replied upon the whole case.

Friday, Dec. 7.

Mr. COLEFAX, in concluding his reply, contended that Mr. Walter's argument was based wholly on the question of load factor, without taking into consideration at all the diversity factor. It was plain upon the evidence that an undue preference was being given to light consumers who also took energy for power; and as this was against the provisions of the Act, the declaration asked for by appellants should be granted, and the appeal allowed.

Lord Justice WARRINGTON: Is not your argument summed up in this: The station gets an advantage by supplying power as compared with the advantage derived from light; but you say that they get no greater advantage by adding light to power?

Mr. COLEFAX: They worsen their own position in so far as a power customer takes light, as it diminishes the diversity factor. There was no justification for the circular in which a difference was made between certain customers.

Lord Justice SWINFEN EADY: They say, come to us for power and

we will give you electricity for light at a cheaper price than your neighbour has it.

Mr. COLEFAX: We will give it to you on the power scale. The judgment of the Court of Appeal in the Long Eaton case proceeded on narrow lines; but there was no qualification at all of the judgment of Mr. Justice Sargant.

The Court reserved judgment.

Excess Profits Duty and Managing-Directors' Fees.

The Court of Appeal have dismissed, with costs, an appeal by Messrs. W. F. Fenwick & Co., Ltd., from a judgment of a King's Bench Divisional Court discharging a rule nisi for a mandamus directed to the Inland Revenue Commissioners, ordering them to give instructions for the deduction of the whole remuneration paid to the Managing-Directors of the Company for the purpose of ascertaining the profits returnable by the Company as excess profits duty, as calculated by comparison between a pre-war year and an accountant year. In the present case, under a pre-war agreement, the three Directors of the Company in a pre-war year divided £12,056 as remuneration. Of this, £7056 was calculated on a percentage of profits. In the accountant year ended December, 1915, they divided £23,098, of which £18,098 was a percentage of profits. The Commissioners had allowed the remuneration in the pre-war year, plus a profit of £600; and the Company contended that they should be also allowed the balance of £5042, as expenses of the Company, before calculating the amount on which to pay excess profits duty.

Fatality in a Gasholder.

Settlements have been effected in three actions before Lord Anderson in the Scottish Law Courts directed against the Cassel Cyanide Company, Ltd., Glasgow; the pursuers being the survivors of men who were in the employment of the Barrowfield Iron Works, Ltd., of Glasgow, and who were overcome by gas and died inside a gasholder belonging to the defenders which they were repairing. Substantial sums of money were paid to the pursuers

Illegal Consumption of Gas.

In the Dublin Northern Police Court, Thos. Farrell pleaded guilty to stealing and consuming gas at his residence during a period of six months, to the value of £10, by constructing a connection from the main pipe to different lights in the house. He was sentenced to a month's imprisonment with hard labour. Robert Moss also pleaded guilty to stealing and consuming gas at his residence, to the value of £30. It was stated that, in this instance, the connection between the main pipe and the house lights must have been in existence for nearly two years. Defendant, an aged man, was ordered to be imprisoned for fourteen days.

Dublin Gas Workers' Dispute Settled.

The award of Mr. J. M. Whitaker, B.L., the Arbitrator in the dispute as to wages between the Alliance and Dublin Consumers' Gas Company and sections of their employees, has now been issued, and has been accepted by both parties. The dispute arose in October, when an application was made by the Irish Transport and General Workers' Union, on behalf of the labourers in the Alliance Company's employment, for an increase of 8s. per week. Application was also made that the men employed in the Company's works at Kingstown and Bray should be brought up to the same standard of wages and conditions as the city men. On arbitration being decided upon, the men who had gone on strike resumed work. At the hearing, it was decided that the slot collectors should be included in the terms of arbitration; and it was then adduced that the Company were paying to all sections of the labourers and slot collectors, in addition to certain increases of wages, a war wage of 6s. per week. The award provides: (1) That the labourers, in addition to the war bonus of 6s. per week, be paid the following additional war wages: (*a*) All whose present weekly wage (inclusive of the 6s.) do not exceed 30s. a week, an additional war wage of 5s.; (*b*) all whose wages exceed 30s., but do not exceed 35s., an additional 4s.; (*c*) all exceeding 35s., but not 40s., an additional 3s.; (*d*) and all exceeding 45s., an additional 2s. (2) All labourers whose normal working hours per week amount to 84, shall, in addition to the war wage of 6s. a week, and the additions granted in the present award, be paid a further war wage of 1s. per week. (3) The new rates to be paid as from the first pay-day following Oct. 27. The Arbitrator considered that the claim of the Bray and Kingstown men to city wages and conditions had not been established. As to the slot collectors. he decided that they should receive, in addition to the 6s., a war wage of 2s. per week.

Irish Gas Prices.—The Lurgan Urban Council last week duly signed and sealed a memorial to the Local Government Board praying for a Provisional Order to enable them to increase the maximum price of gas from 4s. 6d. to 6s. 6d. per 1000 c.ft. It was stated in the discussion that the cost of coal for the gas-works had gone up £325, and the wages bill by £100. The Drogheda Corporation decided to increase the price of gas 6d. per 1000 c.ft. At Monaghan, the Gas Company have intimated an increase of 5d. per 1000 c.ft. in the price of gas. The Bangor (co. Down) Council have appointed a Committee to deal with the question of the price of gas; Mr. Fegan (the Chairman of the Gas Committee) observing that, at 4s. 2d., it was about the lowest in any Irish country town. "The dearest gas in the world" was the remark of Mr. H. Gallagher, a member of the Letterkenny Urban Council, when that body decided to raise the price of the local supply from 8s. 4d. to 9s. per 1000 c.ft.

MISCELLANEOUS NEWS.

QUALITY OF GAS AT TOTTENHAM.

An Improvement.

As has been recorded in the "JOURNAL" for the last week or two, there has been considerable grumbling at the gas supplied in the area covered by the Tottenham District Light, Heat, and Power Company, both as regards lighting and calorific value. Local authorities and other bodies have taken the matter up, and one council has gone so far as to demand a Board of Trade inquiry. We are glad to be able to report a distinct improvement in the supply during the past few days—there has indeed been little, if any, cause for complaint. But whether certain circumstances will operate to permit of a continuation of this increased supply remains to be seen.

"The Tottenham and Edmonton Weekly Herald," which enjoys a very large circulation in the districts supplied by the Company, has come out boldly in defence of the supply. In its last issue, it devoted a leading article to the subject, and certain new facts revealed therein may be worthy of reproduction. It says, *inter alia*: ". . . some of the Gas Company's commodities for gas making have been commandeered by the Government. It has been no secret for several years now that toluol, which is an important constituent of gas, has been extracted for the manufacture of high explosives; and there have been other products which have been taken, to the detriment of gas consumers. It is therefore a part of the inconvenience which we have to put up with in order to win the war. But when we have stated the case so far, in defence of the 'monopoly' so scathingly denounced by certain public men recently, we have not said all that can be said in their favour; for, as most people know, just now there are limitations put upon all of us, under the Defence of the Realm Act, and a few words dropped that might assist the enemy to understand our methods would be likely to lead to severe penalties upon their author. The Wood Green Council have agreed to ask the Board of Trade to hold an inquiry. We should say from what we know that the Gas Company would welcome such an opportunity of putting itself right with the public authorities in their area of supply; for the Board, as a Government Department, is more likely to be impartial in its judgment than the public man who panders to public feeling by coinciding with anything outsiders may say. At the Tottenham Council's last meeting, correspondence between it and the Company was read; but all the Company's explanations about labour and material, and even the Council's own refusal to render temporary assistance to avoid foreseen difficulties, were ignored and resented. For instance, take the Council's letter referring to the Council having declined to allow the Company to meet trouble half way by placing an ornamental pumping-station on a small piece of the Page Green Common. What the Company wanted, we understand, was to do what was succesfully done in the case of the Water Board to avoid a dearth of water in any part of the Metropolis. The Company wanted, for the period of the war only, to bring a gas-main down from the Gas Light and Coke Company's system at Stamford Hill and connect it with the local mains at Broad Lane, Tottenham, so that any surplus supply in the former district might be diverted for the use of Tottenham and district residents. The Council, to the great detriment of our neighbourhood, as it turns out, haughtily refused; and it is as well the public should know the truth. The fact is, the much-abused 'monopoly' has been very much ill-used in its patriotic efforts to meet the Government's demands and those of the public at the same time."

COLONIAL GAS ASSOCIATION, LTD.

A Large Increase in Consumption.

The Ordinary General Meeting of the Association was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. A. J. Kingdon) read the notice convening the meeting; and the Auditors' report and the Directors' report and the accounts were taken as read.

The CHAIRMAN. in moving their adoption, said at the last annual meeting he stated that the 1916 balance-sheet was a record; but the Directors quite expected the results for the present year would be better. He was pleased to say that what they now put before the shareholders had borne out what they then hoped for. Last year, it would be remembered, the increased sale of gas was upwards of 21 p.ct.; and for the present year it was over 16 p.ct., giving the satisfactory sale of 226,000,000 c.ft. Here he should like to mention the interesting fact that the increased sales for the past six years amounted to 102 p.ct., the like of which he did not think had been equalled by any other gas company. No doubt the shareholders had read with satisfaction the details of the past year's working, and agreed with the Directors that the results were excellent. In looking at the figures it would be noticed that coal had cost some £6000 more than in the previous year, including about 4s. per ton extra; while about £9000 more had been received for gas and residuals. Wages, repairs, and general expenses were some £2800 more; and, considering the unrest there had been through strikes in Australia, this would only be regarded as reasonable, especially as it left them with an increase in profit of about £1000. The revenue account figures were all of a favourable nature; and the same could be said of those in the balance-sheet. In comparison with the year to June, 1916, the stores of coal and other materials showed an increase of over £7000; and this, he felt satisfied, the shareholders would consider a very wise provision. As stated in the report, a balance was shown of £10,896; and from this the Directors had written-off for depreciation £2280, and put to reserve a further sum of £450. After providing for debenture interest and pre-

ference dividend, they carried forward £2334—some £450 more than last year. From the figures he had mentioned, he was confident the result of the past year's working would be considered most satisfactory, particularly so as the time had been full of anxiety and difficulties. Last year the shareholders gave the Directors power to increase the 7 p.ct. preference shares from 30,000 to 50,000; and during the year nearly 22,000 shares were taken up. Since June, some more had been issued at par; and as the income-tax was only 3s. 6d. in the pound, so returning £5 15s. 6d. p.ct. net, these shares must be considered a very fine investment—well secured. He especially said "investment," as the shares must be so regarded, seeing that only three transfers had come into the office, through death; and the shares had been taken up at par. There were still some 10,000 to 12,000 shares for disposal, and these could be issued to any applicant at par. The shareholders had perhaps noticed that £16,000 had been expended during the year for extensions of works, &c., necessitated, of course, by the large increase in the sale of gas; and further enlargements would have to be made during this year; as a Colonial manufacturing company required a much larger supply of gas, and had entered into a contract with the Association for five years. It might interest them to know the make of gas per ton had been 12,246 c.ft., and the sale 10,851 c.ft., with a leakage of 9·54 p.ct. The capital was now down to £1050 per million cubic feet—an exceedingly low sum for Colonial works with their output. During the year 1075 more meters were fixed, bringing the number up to 12,232. Nearly 1000 cookers and 656 heaters, grillers, &c., were connected; and they had more than 150 applications waiting to be supplied with gas. As stated in the report, they had with much regret to pay the ordinary share dividend recommended in 7 p.ct. preference shares at the same rate as last year—namely, 6⅛ p.ct.; giving a net amount of 5 p.ct., free of tax. The Directors felt confident the best thanks of the shareholders would be given to the Melbourne Directors, the Works Managers, and others for having done so exceedingly well for the Association through a most anxious and trying year. He should like to mention that Mr. Weir, one of their Melbourne Directors, was in England for a few weeks; and in October and the beginning of November he joined the London Directors at three of their Board meetings. He assured them that their prospects were excellent, and that all was going well with them in Australia. At the last meeting Mr. Weir had with them, they fortunately had the draft balance-sheet, and were pleased to have his opinion that it had his full approval.

Mr. CHARLES HUNT seconded the motion, which was unanimously carried.

The CHAIRMAN then proposed that a dividend be declared at the rate of 7 p.ct. per annum, less tax upon the preference shares for the half year to June 30, and that the dividend be payable in cash. Also that a dividend of 5 p.ct., free of income-tax, be declared upon the ordinary shares for the year ended June 30 (equivalent to £6 1s. 3d. p.ct., less tax, at 3s. 6d. in the pound, being British income-tax after adjustment of allowance in respect of Colonial income-tax), and that this dividend be paid by the issue of preference shares, credited as fully paid, each ordinary shareholder being entitled to one preference share for every sum of £1 to which he or she would have been entitled by way of dividend if such dividend had been declared payable in cash. Fractions of £1 would be paid in cash—such dividends to be payable on the 31st inst. The Chairman added that it was a pleasure to propose this resolution, because a good many companies had in these times to entirely pass their dividends; and they could not even pay them in preference shares. In their case, they were paying the ordinary dividend in 7 p.ct. preference shares. They had earned the money; and if the Government had allowed them to raise money for the purposes of the Company, the dividend would have been paid in cash. Shareholders whose dividends were only small ones—say, up to £5—could probably arrange to exchange shares for cash.

The Hon. Sir JOHN W. TAVERNER, K.C.M.G., in seconding, said he thought, having regard to the great difficulties and troubles brought about by the war, and the necessity of having, for instance, to stock some £7000 worth more coal, he thought they were extremely fortunate in being able to do what they were asking the ordinary shareholders to do—take 7 p.ct. preference shares instead of a 5 p.ct. cash dividend. It was a fair thing; and he trusted it would be approved.

The proposition was unanimously carried.

The CHAIRMAN moved the re-election as Directors of Sir John W. Taverner and Mr. P. C. Holmes Hunt (Chairman of the Local Board). He said it was a great satisfaction to say that in Sir John they had a gentleman who had represented his country in Australia for some years, and had, since his retirement, been a Director of the Company. Through him they had Australian influence in London. Mr. Holmes Hunt was the leading g.s engineer in Australia; and they were gratified that he represented their Association in the capacity of Chairman of the Local Board.

Mr. F. R. SMITH seconded the motion, which was heartily agreed to.

On the proposal of Sir FREDERIC PAINTER, seconded by Mr. W. CHAFFER, Messrs. Wood, Drew, & Co. were re-appointed Auditors.

Sir F. PAINTER proposed a vote of thanks to the Chairman and Directors. He said the Chairman had mentioned that they owed a debt of gratitude to those who were managing their affairs in Australia; but he (Sir Frederic) also thought they owed a similar debt to their Chairman and Directors in London. One thing that had struck him was that their coal had only cost about 4s. per ton more than the previous year. This was a marvellous thing in these times, when it was a difficult matter almost to get anything. They could not in the circumstances of the Directors having to use the profits for other purposes blame them for paying the dividend in preference shares. Therefore, the shareholders would all agree they should give their Chairman and Directors and all who served them in Australia their very best thanks.

Mr. SAWARD seconded the motion, which was cordially passed.

The CHAIRMAN, in his acknowledgment, said the Directors had tried to deserve the vote; and he thought they really had succeeded in doing so on this occasion. He earnestly trusted that the results of the current year would be even better than those of the past one, and that they would have the spare cash with which to pay the dividend. He should like to send out a special vote of thanks to their Managing-Director (Mr. S. E. Figgis), to the Managers of their fifteen stations, and to those who worked under them. They had all earned recognition for their services.

Mr. SAWARD seconded the motion; and it was at once agreed to.

This concluded the proceedings.

TORONTO CONSUMERS' GAS COMPANY.

In their 69th annual report [covering the twelve months ended Sept. 30], the Directors of the Consumers' Gas Company of Toronto stated that there had been an unprecedented demand for gas during the year; and notwithstanding the many difficulties which had arisen because of labour shortage, transportation complications, the high cost of raw materials, increased taxation, and other unusual conditions, the extraordinary call for gas had been fully met, without any large capital expenditures having been undertaken. The increase from the sale of gas had amounted to £519,750, and there had been a very closely corresponding increase in operating expenses; the cost of coal, oil, and other raw materials, and labour, having been very much higher than in the preceding year.

A gratifying feature of the year's operations was the development of the sale of gas, in large quantities, for industrial purposes. The higher prices of coal and oil resulted in the very general adoption of gas as fuel by industrial concerns; and there is good prospect of this branch of the Company's business being still further extended. The Company have also been called upon to supply very large quantities of gas to the military hospitals, camps, and depôts; and the service they have been able to render has proved most satisfactory to the military authorities.

Of the employees, 40 p.ct., or 393, voluntarily enlisted for active military service; and of this number, unhappily, 35 have made the supreme sacrifice.

The following statement compares the past with the preceding year:

	Meters.	Gas Sales.
Year ended Sept. 30, 1917	108,719	$3,007,423.89
" " Sept. 30, 1916	104,541	2,487,673.79
Increase	4,178	$519,750.10

BELFAST NEW GAS PRICES.

At a meeting of the Belfast Corporation on Monday of last week, reference was made to the new scale of charges for gas.

Alderman CRAIG called attention to the minute of the Gas Committee recommending the following increases in the price of gas: Lighting, cooking, and heating, through ordinary meters, from 2s. 11d. to 3s. 6d. per 1000 c.ft., less 20 p.ct. (or 2s. 9d. net); motive power, 2s. 6d. to 3s. 1d. (or 2s. 5d. net); for the Cregagh district, outside the boundary, 3s. 9d. to 4s. 4d. (or 3s. 5d. net); for high pressure, 3s. 1d. to 3s. 8d. (or 2s. 11d. net). He said the Committee had been reluctant to take action in this manner; but the state of the finances left them no option. They had had hopes that they would have been able to pull through; but the advance of 2s. 6d. on the minimum price of coal, conceded to the collieries by the Controller in September, settled the matter. The advance meant an extra expenditure for coal alone of £13,000; while the salaries and wages advance came to £15,000. Though they expected £8000 more from residuals, this would not be sufficient to balance the heavy charges referred to. The rates ruling in England and Scotland showed that, with the exception of one or two cities close to the coal-fields, they in Belfast were charging less than the average price—this in spite of the fact that they had to pay extra freightage on all coal of about 8s. per ton. The Committee were alive to their obligations to supply the gas at the lowest possible price; but they were also bound to see that the rate was sufficient to keep the finances in a sound condition. He proposed the adoption of the minute.

Mr. ALEXANDER moved as an amendment that the matter be referred back to the Committee. Within the last five years, he said, the undertaking had made gross profits amounting to £314,897; and he contended that there was neither sense nor justice in advancing prices in order to enable the making of such enormous profits. Dear gas was a hardship on the great body of the citizens. In July last the price was increased from 2s. 3d. to 2s. 11d. per 1000 c.ft., which meant a tax of £40,000 upon the gas consumers; and now it was proposed to put another tax of £40,000 upon them.

Mr. SQUIRE said that, in addition to the coal question, the problem of oil was a very serious one just now. Though they had a contract running at 2¼d. per gallon, they had to pay about 1s. 10d. for any extra supply they needed.

Mr. ATKINSON said the Committee had always given the consumers the benefit of advantageous contracts; and in this respect, they ought to recognize the foresight of the management.

Alderman CRAIG said the price of gas through slot meters would not be altered, as the increased rate they hoped would be only temporary, and it would cost more to alter these meters than they would receive by the extra charge. While there had been an increase in the price of gas, he asked the Council to remember that there had been a reduction within the past four years.

The amendment was defeated by a large majority, and the minute was then adopted; words being introduced giving it effect as at the beginning of the next quarter.

The Luton Town Council have been notified by the Gas Company that, in consequence of the high price of coal and labour, they are not able to charge the Corporation during 1918 a lower price for gas than the ordinary consumer.

ANGLO-PERSIAN OIL COMPANY, LTD

EIGHTH ORDINARY GENERAL MEETING.

The Company's Progress—Increase of Capital.

The Eighth Ordinary General Meeting of the Anglo-Persian Oil Company, Ltd., was held on Dec. 3 at the Registered Office, Britannic House, 23, Great Winchester Street, E.C., Mr. CHARLES GREENWAY (Chairman and Managing-Director) presiding.

The SECRETARY (Mr. F. Macindoe) having read the notice convening the meeting and the report of the Auditors,

The CHAIRMAN said: Gentlemen, the Directors' report, balance-sheet, and profit and loss account having been duly circulated, we will, with your permission, follow the usual course of taking them as read. I am pleased to say that there has been some acceleration—about five weeks—in the presentation of the accounts this year; but they would have been submitted a month earlier had it not been for the postal delays now occurring. In the future, subject, of course, to postal irregularities, I hope we may be able to submit them not later than in the month of October in each year.

THE ACCOUNTS.

I will now ask you to kindly give your attention to the printed figures. Dealing first with the balance-sheet, you will see that the paid-up capital stood at £3,250,000, being an increase of £250,000 upon the figure of the previous year, due to the payment by His Majesty's Government of a further call of that amount. This payment brought the total amount of capital provided by the Government up to £1,251,000, leaving a balance of £949,000 still due at the end of the financial year, out of the £2,200,000 which they undertook to provide by the agreement of 1914. This balance they have, as mentioned in the report, recently paid. I may mention that in addition to £199,000 of debenture stock which has been issued to the Government in respect of a portion of the payment to which I have just referred, we have issued a further £1,400,000 of that stock, bringing our total debenture issue at date up to £2,000,000. Including these debentures, the total capital now issued amounts to £6,000,000. Beyond these debentures we have no liabilities outstanding, either in respect of our recent large acquisitions of shares or on any other account, excepting the contingent liability of £209,741 2s. 2d. to the Burmah Oil Company, other than the usual liabilities to trade creditors, which are more than offset by the amount due to us by sundry debtors. The other items on the debit side are self-explanatory, and do not, I think, need any comment. Coming to the credit side of the account, you will see that there has been an increase of about £200,000 in the first item, this being due to additional shares which have been taken up in our subsidiary companies to provide the further capital required by them from time to time for necessary developments. The item of refinery, tank installations, pipe-lines, &c., also shows an increase of about £145,000—this representing the outlay on the various large extensions which were carried out during the year, less the depreciation on the whole which has been written off. The only other item in this account requiring comment is the claim against the Persian Government for the losses sustained by this Company owing to the rising of Persian tribesmen in 1915. As you will see, these losses have now been ascertained to have amounted to the large total of £402,887 3s. 1d.; and a claim has been lodged against the Persian Government for the payment of this amount. The further claims of our producing companies for losses sustained by them on the fields amount to £211,602, making a total of £614,489 3s. 1d. due to us by the Persian Government; and it is perhaps superfluous for me to say that had it not been for this destruction of property by Persian tribesmen, the profits of the Anglo-Persian Company during the past two financial years would, to the extent that the claims represent loss of revenue, have been correspondingly greater.

THE TRADING PROFIT.

Turning to the profit and loss account, you will see that the trading profit for the year amounted to £415,827 5s. 10d., as against £171,723 1s. 4d. in the previous year, which fully confirms the anticipations expressed by me when I last had the pleasure of addressing you. This result has been arrived at after making a very liberal allowance for depreciation; and in view of the fact, to which attention is drawn in the report, that this profit only includes a very small benefit from the capital subscribed by His Majesty's Government, I think it may be considered as eminently satisfactory. During the current year we shall be deriving the full benefit of the extensions which have been carried out with the first half of this capital, and the year is now sufficiently advanced for me to be able to say with confidence that the trading profit shown in our next accounts will not be less than £800,000, and will probably be nearer £1,000,000. And this profit, gentlemen, I would particularly like to emphasize can in no sense be regarded as "war profit" inasmuch as practically the whole of our products were either contracted for before the war, or, in the case of those contracted for since, have been sold at pre-war prices. As regards excess profits duty, this Company, in common with all concerns which were in process of development on the outbreak of war, is in the unfortunate position of having a very low pre-war standard of profits. We have therefore claimed to be assessed on a capital percentage basis, and this has been fixed at 11 p.ct., in addition to which we shall, of course, get the allowance of 3 p.ct. on new capital put into the business since the beginning of the war. I think I may safely say there will be no liability for this duty in respect of the past financial year. What the amount may be for the current year it is impossible at present to estimate, but in any case there will be an ample sum available for the payment of the full 8 p.ct. dividend on the preference shares, as well as one on the ordinary shares.

MISLEADING REFERENCES IN THE PRESS.

In this connection I would like to refer to some misleading references to this Company which have appeared in the Press during the past twelve months. Some of these journals, quite disregarding the explanations which I gave last year—that no portion of the plant for which Government capital was provided had been in operation, and that our refineries had, from quite exceptional causes, been shut-down for about five months—took the profits of the preceding year, and tried to show from them that the Government had made a very bad investment. Another referred to the Government having "dabbled in petroleum, to the nation's cost," and to their having sunk "millions" of public money in Persia, &c., &c. To these writers I would commend a careful study of the accounts we are now submitting, and still more of those which we shall be submitting for the current year. From the former they will see that not only had the Government, when these comments were written, not sunk "millions," but only one million and a quarter, but also that this million and a quarter had only just begun to fructify. No one can expect eggs to produce chickens until they are hatched; but the best proof that the Government eggs in this Company are in the course of being satisfactorily hatched is that, if it were possible to assume that the Government repented of their bargain, I would undertake to find a purchaser for their 2,000,000 shares at not less than £6,000,000, and probably for as much as £8,000,000. This increment on an investment of £2,000,000 which has only been locked-up for an average period of eighteen months is, I think you will all agree, a magnificent one, and one that quite refutes any suggestion that the Government have by their investment in this Company made a bad investment or squandered public money. But this increment is, I predict with confidence, only a small instalment of the increment that will be shown five to ten years hence, when we shall have been able to build refineries more commensurate with the vast supplies of crude which we have at our disposal. You all know, gentlemen, the time occupied, even under peace conditions, in laying pipe-lines, erecting tanks and refineries, building jetties, and in carrying out the other extensive engineering operations connected with the development of a large oil-refining business in a country so remote as Persia. Under war conditions, with the difficulties of obtaining delivery of steel plant of all kinds, the delays in ocean transport, accentuated by the occasional loss of essential portions of plant by the action of enemy submarines, the interruptions to work caused by the scarcity of labour, &c., the time occupied is necessarily very much greater; and in the circumstances we consider ourselves very fortunate indeed that we have been able to complete one-half of the programme for which the national money was provided at the beginning of this year. The other half of it will not, I am afraid, be practicable to complete for some considerable time, and in the meantime we shall have to be satisfied with only a portion of the benefit of the national investment. This portion will, however, as I have just indicated, be eminently satisfactory; and when the whole benefits are shown, they will be such as to gratify the desires of any investor.

FUEL OIL AND OTHER CONTRACTS.

While on the subject of the future profits of the Company, I should like to take this opportunity of announcing that the Government of India, after a long series of experiments and trial runs, which have amply demonstrated the greater efficiency and economy of oil, have recently decided to substitute to a large extent oil for coal on the Western Indian Railways. This substitution will not only be of financial advantage to the railways, but it will also—and this, as you all know, is a matter of the very greatest national importance at the present time—effect a very considerable economy in tonnage, inasmuch as the time occupied in carrying coal from Bengal to the West Coast of India is about thirty days for the round voyage, as against only fifteen days for the round voyage for oil from the Persian Gulf, while oil as a fuel for locomotives has, roughly, twice the efficiency of coal. In other words, to carry the fuel equivalent of 1,200,000 tons of coal, oil will only occupy space to the extent of 300,000 tons. The great importance to the nation at the present time of stress of the enormous economy of tonnage which will thus be effected is too obvious to need any elaboration; but I would like to take the opportunity of remarking that this is another of the many benefits which this country is gaining from the Government's participation in the business of this Company. A similar substitution will, I understand, be carried out shortly on the Mesopotamian Railways, whereby a further large economy of tonnage will be effected. You will be pleased to learn, gentlemen, that the contracts which we have secured for fuel oil and other products now amount to a total of no less than 12,000,000 to 15,000,000 tons. The value to the Company of this enormous volume of assured business is immense; for it renders us absolutely independent for many years to come of all competition. Rate wars, or no rate wars, we shall always be certain of some profit, no matter at what prices we may have to sell our benzene and kerosene; and we can therefore regard with perfect equanimity any competition that may present itself in these products. This, gentlemen, is an extremely happy position for an oil company to be in when, as in our case, it can be sure of an ample supply of the raw material; for it renders us absolutely unassailable, and enables us to take advantage of such opportunities as may occur for advantageously marketing the balance of our products.

THE NAVY AND FUEL OIL.

One of the journals to which I previously referred expressed a very earnest desire to be informed of the extent to which this Company has been able to assist the Navy by deliveries of fuel oil. I should like very much to give this figure, because it would greatly emphasize the national importance of the Company; but I am afraid that I cannot give the information asked for without committing a serious breach of the provisions of the Defence of the Realm Act. The divulgence of this information must therefore be withheld until the conclusion of the war, when it can be disclosed without any danger. Apart from this assistance, however, the fact that the Admiralty and the War Office have had this substantial source of supply to draw from, in addition to others, has not only been of great service to the operations of the Allies, but it has, by the competition which it has created, undoubtedly saved the nation many millions of public money in the lower prices at which it has enabled the Government to purchase the balance of its supplies. Though the Company will, when the extensions now under contemplation are completed, doubtless be able to provide the whole of the British Naval requirements of fuel oil, and also the requirements of the other Government Departments generally for all petroleum products, it would not be wise, either politically or economically, for the

Government to rely upon any one country as its sole source of supply; but we shall, as you will have gathered from what I have said as to the volume of business already secured, have no difficulty at all in finding outlets for the balance of our production, apart from the great trade which awaits petroleum and benzol producers after the conclusion of the war, as the result of the extended use which is being developed by the war for spirit and petroleum products of all kinds for railway, marine, aviation, and industrial purposes.

STATE PARTICIPATION.

Mr. Walter Long recently, in the House of Commons, said "that oil is probably more important than anything else; you may have men, munitions, and money, but if you have not got oil all other advantages will be of comparatively little value." Of this fact there can be no gainsaying. Although it has only recently come home to the minds of the people of this country, a nation which again enters into war without an ample supply, absolutely free from foreign control, of fuel oil for the service of its naval and mercantile fleet, or benzene for its motor transport and aircraft, of oil for the lubrication of the many mechanical appliances which so largely enter into modern warfare, and of aromatic hydrocarbons for the manufacture of high explosives, will be committing an act of madness. These are just as necessary for the successful conduct of a war as men, ships, or munitions; and, although in these days of great events and of wholesale upheavals of old political shibboleths, the national importance of the transaction is apt to be overlooked, the Minister and Cabinet who first recognized this essential fact by securing control of this Company, and who thereby established an important source of supply, free from foreign or monopolistic domination of any kind, of a commodity which is necessary for our national existence, performed a greater service to this country, both financially and politically, than even did Disraeli when he concluded his historic purchase of Suez Canal shares. (Hear, hear.) A further very desirable step in the same direction is now being taken by the Department which has been recently constituted under the presidency of Mr. Long in its efforts to promote the production of indigenous oil. But, although a good deal may be done in the development of production of oil from shale and coal, it is hopeless to expect that these sources of production can compete with natural oil, excepting under particularly favourable conditions, or that the quantity produced will ever meet the whole of the national requirements. And, so far as natural oil is concerned, the chances of finding it in quantity in this country are, if the opinions of geologists are of any value, so remote as to render this a very uncertain source of supply. Therefore, in addition to the steps which are being taken in connection with indigenous oil, what is wanted is an extension of the policy initiated when the Government secured a controlling interest in this Company, and the formation of an all-British Company, similarly controlled and free from foreign taint of any kind, to deal with the development of oil-fields outside of the British Isles. This Company might absorb all the existing British oil-producing companies, and at the same time undertake the examination and exploitation, so far as concessions are obtainable, of all the known oil territories of the world not already taken up by these or other companies, but directing its attention more particularly to the British Colonies and Dependencies and to countries whose friendship can be relied upon. Some step of this kind is all the more essential now that the United States—hitherto the chief source of supply of the world—has come to the point where demand is overtaking production, and is beginning to have grave doubts as to whether she will be able to maintain her export trade for many years longer.

PURCHASE OF SHARES OF GERMAN COMPANIES.

In connection with the commercial aspects of the Company's business, I will now refer to the important development which has recently taken place in the purchase of the shares of the German companies known as the British Petroleum Company, Ltd., the Homelight Oil Company, Ltd., and the Petroleum Steamship Company, Ltd. The two former are what are known in the trade as distributing companies, and their organizations will, later on, when our present arrangements for the sale of benzene and kerosene come to an end, doubtless prove a most valuable acquisition, as they will provide a means of disposing of our output of these products at much better prices than we are realizing at present, for without such an organization oil companies have necessarily to surrender to intermediaries a large portion of the profits realized by the sale of their products. These companies have, unfortunately—owing to the arrangements which have been made by the Board of Trade for the regulation of petroleum supplies with a view to economizing man power and tonnage—had to abandon their share of the benzene trade of this country for the period of the war. They are, however, continuing their trade in kerosene, obtaining their supplies from the same sources as before, and will, in the meantime, make all necessary arrangements for resuming their business in benzene after conclusion of the war on a scale that will ensure their securing a substantial share of the trade of the United Kingdom. In this connection I may mention that the Company's production of benzene is now at the rate of about 150,000 tons per annum, and will, by the time our extensions are completed, probably amount to 600,000 to 700,000 tons per annum. This may appear to be a very large figure compared with the United Kingdom's pre-war trade of less than 400,000 tons per annum, but with the very large increase in motor transport of all kinds which will certainly take place in this country, and in Europe generally, after the conclusion of the war, and to the entirely new demand which will have been created by the great development in aviation, I have not the slightest doubt that there will then be an offtake for all the benzene and all the benzol which the world will be able to produce. You have all probably read of the enormous increase in the consumption of benzene which has taken place in the United States during the past few years. The consumption there has now gone up to 5,000,000 to 6,000,000 tons per annum, or to about six times the total pre-war consumption of the United Kingdom and Europe, the population of which is vastly greater, and with the new aviation demand which is now being created, America's requirements will no doubt in the future be very much larger. The same ratio of consumption will (given the necessary supplies of spirit) sooner or later be developed on this side of the Atlantic; and as it will be quite impossible for the United States to meet this demand, even if she can spare any at all for export, it is obvious that there is ample room in these markets for all the spirit that can be produced elsewhere for many years to come.

THE COMPANY'S FLEET.

The purchase of the shares in the Petroleum Steamship Company, Ltd., has given us an addition of nine tankers to our fleet, which, as mentioned in the report, now numbers 22 vessels of a deadweight capacity of 130,915 tons. In addition to these, we are managing nine other tankers of a deadweight capacity of 74,500 tons, bringing the total number of boats now being run by us up to 31, of a deadweight capacity of 205,415 tons. This fleet, though large, will not nearly suffice for our future requirements, and will need to be augmented considerably whenever it may be practicable to purchase or build some additional tonnage.

THE NEW PIPE-LINE.

Our new 10-in. pipe-line was completed in January last and has since been working very satisfactorily. Unfortunately, however, a serious fire at our pumping station at Tembi in July last, which was, I regret to say, accompanied by the loss of the life, under particularly heroic circumstances, of our chief engineer there, Mr. R. L. Lindsay, has partly deprived us for the time being of the use of our small line; but we are still able to deliver to Abadan all the oil that our refineries will be capable of dealing with until our extensions are completed. That the whole station was not destroyed was entirely due to the great bravery displayed by Mr. Lindsay, who, when the outbreak took place, rushed through the flames to almost certain death to close-down the valves, and to the aid given him by one of his assistants, Mr. Still, who very ably and at great risk to his life seconded Mr. Lindsay's efforts. You will all be pleased to learn that this great courage and devotion to duty has been recognized by His Majesty by the bestowal on Mr. Lindsay of a posthumous decoration of a gold Albert Medal, the civilian equivalent to the V.C., and on Mr. Still of the ordinary Albert Medal, and also that these services have been liberally recognized by the Company. (Hear, hear.) The necessary repairs are being carried out with as little loss of time as possible, and we are also at the same time arranging to erect the additional pumping stations necessary to bring the capacity of the lines up to a total of 3,000,000 tons per annum.

REFINERY EXTENSIONS.

As mentioned in the report, the refinery extensions to which I referred in January last have not yet been completed, owing to the loss at sea of some of the plant and to the delay under present conditions in replacing it; but we hope to get them in operation in the course of a few months. Further large extensions now require to be taken in hand immediately to meet urgent war requirements. The plant for these has already to a large extent been ordered; and to meet the additional capital outlay which will be incurred on them it is proposed to make an issue about a fortnight hence of a further 1,000,000 participating preference shares. These shares, which will rank for dividend as from Oct. 1 last, will be issued at a premium; and at the conclusion of this meeting I shall submit to you the resolution necessary for carrying this increase of capital into effect.

FIELDS AND PRODUCTION.

As regards the fields which are being developed and tested by our producing companies, you will have seen from the report that these continue to show most satisfactory results. In past years we have hesitated to state the full extent of our belief in the great extent and richness of our oil territories; but the confirmatory evidence which we get as we proceed with our developments so exceeds our most sanguine expectations that the time has now come when we can express the opinion with a good deal of confidence that the oilfields embraced in our concession are among the most extensive and prolific of any in the world, and that Persia may even one day become as big a producer of oil as the United States. One evidence of this is that in the field from which we are getting our crude we could, had we the refineries to deal with it, now obtain a production of something like 4,000,000 tons per annum from the wells which have so far been carried down to the main horizon. These wells, nearly the whole of which have necessarily to be kept shut-down until we can deal with their oil, are pretty widely scattered over the field; and, so far as can be judged, all the intervening territory is equally rich, since the gas pressure is constant throughout the field. I have several times previously referred to well No. 7 F., and you will be interested to learn that this well, which has so far yielded something like 1,750,000 tons of oil, still continues to produce as freely as ever, with practically no diminution in the gas pressure. This well, I may mention, is by no means exceptional, since many others which we have opened and tested appear to be just as prolific; but I quote it as it is the only one from which we have been able to regularly produce, and therefore to properly gauge the extent of its producing capacity, and of the capacity of the field as a whole. The measure of the richness of this field can be better appreciated when it is remembered that the production now obtainable from it is larger than the pre-war production from the whole of the Roumanian and Galician oilfields, to obtain which production a total of something like 2000 wells had to be worked, and a capital of about £40,000,000 was employed.

OTHER RICH OILFIELDS.

But this is not the only field which we have to rely upon for our supplies. Adjacent to it we have, as I mentioned at the last meeting, proved another field, which promises to be just as rich, and we have recently received a telegram reporting that another well which has been sunk on it has practically proved an additional square mile of productive territory. In the second outside field to which I referred last year, the test well has now been carried down to 2195 ft., and is passing through favourable strata. In the third outside field oil has been struck with strong gas pressure; and, although it has not yet been practicable to test the capacity of this field, there is ground for anticipating that in it we have secured another valuable addition to our reserves of oil. This last field is, I may mention, situated some hundreds of miles nearer to the mouth of the Persian Gulf than any of the other fields so far tested by us, and is in close proximity to a deep

water harbour, and, as there are several other good anticlines in the neighbourhood, we are hopeful that this may prove to be a field of the greatest importance. A further outside field which is now about to be tested is reported by our geologists to be of larger area than, and as likely to be just as rich as, the one from which we are now obtaining our production. In order that you may better appreciate the extent of the oil territory included in our concession I have had a map hung up for exhibition; and after the meeting I shall be pleased if shareholders will examine it, and I shall be glad to give them any explanation they may desire regarding it. From what I have said now and on former occasions you will, I think, be able to appreciate that so far as supplies of crude oil are concerned there is, as far as can be judged, practically no limit to our potentialities. The only limits are (1) refineries, and (2) outlets for our manufactured products. The first of these is, in these days of shortage of steel, our principal difficulty; but we shall lose no opportunity of pushing on with the erection of further refineries until we are in a position to more adequately deal with the enormous supplies of crude which we have available. As regards the second limitation—viz., outlets for our products—there is, as I have already indicated, little to fear.

QUALITY OF OIL.

One other point of importance in connection with our crude which I should not pass over is that it is of an exceptionally high grade and much superior to the average of the oils produced on the American Continent. It contains a very large percentage of benzene and kerosene of the best quality, excellent lubricating oils, fuel oil of very high thermal efficiency, and a good percentage of first-rate paraffin wax. This means that our crude is much more valuable than that of most of the producing fields of the world, while its cost of production, inasmuch as it is all obtained from flowing wells of big volume, entailing the minimum of field expenditure, is much lower. These advantages, I may say, far more than compensate for any disadvantage at which we may be placed in freight as compared with fields which may be more favourably situated geographically for supplying European markets.

STAFF AND WAR SERVICE.

Before concluding my remarks, gentlemen, I would like again to draw attention to the work of our staff both in London and in Persia during the past year. I have already referred to the magnificent services rendered to us by the late Mr. Lindsay and by Mr. Still; but these are only characteristic of the devotion to duty which has been displayed by all, and which is inspired by the knowledge that they are serving a Company in which the Government is the predominating partner and in work which is of vital importance to the nation in the prosecution of the war. The Company has earned the distinction—a unique one for a public company, I think—of a "mention in despatches." But the word "Company" in this case is only a synonym for our staff, who have in many directions, and often at considerable risk to their lives, rendered services of a very valuable character to the authorities throughout the period of the military operations in Mesopotamia. Among other things they have rendered a large amount of assistance in the shipbuilding which has been going on in the Gulf, more particularly in the erection and fitting of the gunboats now operating on the Tigris, a large number of which were built in the Company's yards.

THE POLITICAL SITUATION.

In this connection I have much pleasure in stating that the political situation in the part of Persia in which we are working remains in the same state of tranquility as when we last met, and that we are able to carry on our operations in every direction without let or hindrance of any kind. I am also pleased to report that our relations with the Persian Government and with the local chiefs continue to be of a most friendly character. I now beg to move: "That the report of the Directors, balance-sheet, and profit and loss account for the year ended March 31, 1917, be received, approved, and adopted." I will ask Lord Inchcape to kindly second this motion; but before putting the resolution to the meeting I shall be glad to answer to the best of my power any questions you may desire to put.

The Right Hon. Lord INCHCAPE, G.C.M.G., K.C.S.I., K.C.I.E., seconded the resolution.

Mr. A. R. RICARDO: Mr. Chairman, I should like to ask whether the loss owing to the destruction of pipe-lines by the Persian tribes is being recouped by the Company by withholding the royalties due to the Persian Government.

The CHAIRMAN: Yes; that is so. We are not paying any royalties until that claim has been met.

The resolution was then put, and carried unanimously.

THE DIVIDENDS.

The CHAIRMAN: The next business before the meeting is the declaration of dividends, and I now beg to move: "That an additional dividend of 2 p.ct. on the preference shares, making 8 p.ct. for the year, be paid in respect of the year ended on March 31, 1917, such dividend to be paid on Jan. 31 next together with the 3 p.ct. interim dividend then falling due, and that a dividend of 6 p.ct. per annum on the ordinary shares in respect of the same year be paid on the same date." In moving this resolution I would like to draw attention to the appropriations of £50,000 and £100,000 respectively which have been made to the preference share reserve fund, and to the general reserve fund. The first of these appropriations has been made as the nucleus of a fund to be established for the protection of the preference shareholders in accordance with the terms of our original prospectus. The second has been made with the object of building-up a fund for the purpose of amortizing the cost of our concession and other properties. Both of these appropriations, which I have no doubt we shall be able to augment considerably in the near future, will, I am sure, meet with your approval. I will now ask Mr. Cargill to kindly second this motion.

Mr. JOHN T. CARGILL seconded the resolution, which was unanimously agreed to.

DIRECTORATE CHANGES.

The CHAIRMAN: The next resolution which I have to move is for the election of Directors. Before proceeding to this matter, however, I would like to take the opportunity of referring to the great loss which we have sustained since we last met, in the death of our esteemed colleague, Mr. W. Knox D'Arcy. As you all know, it is to Mr. D'Arcy's enterprise and farsightedness in securing and exploiting the Persian oil concession that the Anglo-Persian Oil Company owes its existence to-day. But what many of you probably do not know is that it is entirely due to his strong spirit of Imperialism that the concession now remains in British hands, and it is a matter of the very greatest regret to us all that he should not have been with us for a few years longer to see a fuller realization of the expectations which he had formed as to the great future which awaited this Company. Mr. D'Arcy, like that other great pioneer, Cecil Rhodes, with whom he had many traits in common, was a man of large heart and great integrity; and in his death we have to mourn the loss of a valuable colleague and an esteemed friend. I will now pass on to the subject of the resolution. Since we last met we have elected Mr. F. W. Lund and Mr. Frank C. Tiarks as members of the Board; and their election now requires confirmation. Everyone who knows these gentlemen will, I am sure, agree with me that by securing their co-operation we have materially strengthened the Board, and therefore I have no doubt that you will cordially support their re-election. We are advised that the election of Admiral Slade as an ordinary Director also needs confirmation; and this appointment will likewise, I am sure, be agreed to unanimously. The Directors retiring by rotation are Mr. John T. Cargill, Sir Campbell K. Finlay, and Mr. H. E. Nichols. They are all eligible for re-election, and I have no doubt that you will wish that we should continue to avail ourselves of their valuable services. I now beg to move: "That the election of Mr. F. W. Lund, Mr. Frank C. Tiarks, and Admiral Sir E. J. W. Slade as members of the Board be confirmed, and that Mr. John T. Cargill, Sir Campbell K. Finlay, and Mr. H. E. Nichols, who retire by rotation, and are eligible for re-election, be, and are hereby, re-elected members of the Board." I will ask Sir Hugh S. Barnes to kindly second this motion.

Sir HUGH S. BARNES, K.C.S.I., K.C.V.O., seconded the resolution, which was unanimously approved.

Mr. G. A. FITZADAM-ORMISTON: I have pleasure in proposing: "That Messrs. Brown, Fleming, and Murray, C.A., be re-elected as Auditors for the ensuing year at such fee as may be determined by the Board."

Mr. W. A. BUCHANAN seconded the motion, which was agreed to.

EXTRAORDINARY GENERAL MEETING.

The CHAIRMAN: That, gentlemen, concludes the business of the Ordinary General Meeting. We will now proceed to hold the Extraordinary General Meeting of which notice has been given, and I will ask the Secretary to read the notice convening that meeting.

The SECRETARY read the notice convening the meeting.

The CHAIRMAN: Gentlemen, I do not think the resolutions which are to be submitted to this meeting require much explanation. As I have already mentioned at the preceding meeting, the additional capital is being created to provide the funds necessary for further extensions which are to be carried out immediately, in order to meet urgent w r requirements of fuel oil and other products. Although undertaken at the moment to meet these urgent war requirements the plant will, it is scarcely necessary to say, be of permanent utility, as it will be of the same character as that already installed, and will after the war serve to produce the various commodities for which we have entered into more permanent contracts. With regard to the second resolution, I would explain that the object of this is to maintain the majority of votes now held by the Government. They now hold 2,001,000 votes out of 4,000,000. With the proposed alteration they will hold 4,001,000 out of 8,000,000. The great advantages of the Government association are so obvious that they need no explanation; and I am sure you will support this resolution most cordially. I now beg to propose the first resolution, viz.: "That the Board be, and they are hereby, authorized to increase the capital of the Company to £5,000,000 by the creation of 1,000,000 additional preference shares of £1 each, ranking in all respects *pari passu* with the existing preference shares of the Company." I will ask Lord Inchcape to second this motion.

Lord INCHCAPE seconded the resolution, which was unanimously agreed to.

The CHAIRMAN: I now beg to propose the second resolution—viz.: "That the Articles of Association of the Company be altered by cancelling the first sentence of Article 70 and by substituting therefor the following sentence: 'Every member shall have one vote in respect of each preference share held by him and two votes in respect of each ordinary share held by him.'" I will ask Mr. Cargill to kindly second the motion.

Mr. J. T. CARGILL seconded the motion, which was unanimously adopted.

PREFERENCE SHAREHOLDERS' MEETING.

The CHAIRMAN: That concludes the business of the Extraordinary General Meeting. We will now proceed to hold the Preference Shareholders' Meeting, and I will ask the Secretary to read the notice convening that meeting.

The SECRETARY read the notice convening the meeting.

The CHAIRMAN: Gentlemen, the resolution to be submitted to this meeting is self-explanatory. The only point in connection with it in regard to which shareholders would, perhaps, like some explanation is as to the method which will be followed in allotting applications for the new capital. The Board have not yet settled this beyond deciding that preference of some kind will, of course, be given to existing shareholders. One or two preference shareholders have written suggesting that they are entitled to an allotment *pro ratâ* to their existing holdings. But I would point out that the ordinary shareholders, who have gone for many years without dividends while the preference shareholders have had theirs guaranteed, are also entitled to some consideration in this matter; and to the extent of their interest in the Company the Board will have no alternative but to pay some regard to their wishes in the matter of allotments. With this explanation I now beg to propose: "That this meeting of the holders of the preference shares

of Anglo-Persian Oil Company, Ltd., hereby consents to the increase of the capital of the Company to £5,000,000 by the creation of 1,000,000 additional preference shares of £1 each, ranking in all respects *pari passu* with the existing preference shares of the Company." I will ask Mr. Cargill, who represents the principal preference shareholder, to second the resolution.

Mr. J. T. CARGILL seconded the resolution, which was carried unanimously, and the proceedings then terminated.

STREET LIGHTING AT BOLTON.

A considerable part of the discussion at the last monthly meeting of the Bolton Town Council had reference to the respective values of gas and electricity for street lighting.

Mr. CROWTHER drew attention to the lighting of the town, and said there were 6000 lights in the borough at the present time. Of these, 550 were in places of danger but were turned off at 10.15 p.m.

Mr. POTTS remarked that there was much confusion outside as to why they could not have better lights. If the Chairman of the Committee could only explain matters, it would save a lot of trouble in the future.

The MAYOR (Alderman Knowles Edge, J.P.) said the public would be educated on the subject, when they saw the lights proposed by the Council.

Mr. HEAPS, referring to the 98 flare lamps which the Council intended putting up, said he hoped they were not going to be reckless in the matter. The question had been talked about a good deal in the town; and people said they would like to see the streets lighted by electricity. He asked how many communities there were lighted with electric light that were a financial sucess. A number had put in the electric light, but after a time had had to go back to gas. The people who wanted lights were men and women who went out at 5 a.m., and returned in the dark evenings. There was, too, the cost of what they were bound to regard as an experiment. They might spend anything from £600 to £1000 on what was not merely a war emergency measure, but was intended to cover seven years. It was proposed to scrap the gas-lamps and pillars in these particular streets. He admitted that the present street-lamp was not a credit to the town; and they had spent as much money on broken mantles in lamps that were not wind-proof as would have purchased the best lamps in the market. The electricity works to-day were working at their maximum, and the gas-works at the minimum; and at the same time they were told by the Government to make more gas. In a matter of this kind, the Committee should proceed very cautiously indeed.

Mr. JOSEPH TAYLOR read out a list of towns which had reverted from electricity to gas, and were unashamed of the fact—specially mentioning Whitehall, Pall Mall, Piccadilly, and Regent Street, as well as the high-pressure gas-lamps outside Buckingham Palace. He said that in Bolton they had never had a chance of showing what could be done with gas. In seventeen towns, there were 221 miles of electric lighting, against 4035 miles of gas. Both in respect to efficiency and cheapness, gas came out much better than electricity.

Alderman RIMMER thought they should allow the Electric Light Committee to carry out their experiments; and they would provide the public of Bolton with better lighting in the very near future by the proposed new system. At present they were "starving" for light; so surely they should leave the Lighting Committee to go on with their work, even at a cost to the town of £400 to £500.

Mr. RITSON said it was a question of the safety of the public, and not whether it should be gas or electricity.

Mr. JACKSON pointed out the difficulties they would encounter in buying new lamps for the town. He drew attention to a place in Bolton where they made gas, and the cost was about 4d. per 1000 c.ft. It was so cheap that they never thought of lighting by electricity.

Mr. MARSHALL (the Chairman of the Lighting Committee) said the scheme put forward had been adopted for public safety. In lighting 98 flare lamps, they released 115 controllers; and this was what they were short of. They did not intend to do away with gas, as suggested by some people.

The proceedings of the Committee were then carried without a dissentient.

EDINBURGH WAGES AWARD.

The arbitration over the question of the wages of the employees of the Edinburgh and Leith Gas Commissioners, referred to in the "JOURNAL" for the 27th ult. [*ante*, p. 426], was held at the gas-works; the Arbitrator appointed by the Chief Industrial Commissioner being Sir Richard Lodge, of Edinburgh, who acted in this capacity last July.

The application put forward by the National Union of Corporation Workers in September last was: (1) That war bonuses previously granted should be converted into war wages; (2) that a further 10s. increase of wages be granted to male employees, and 5s. to female employees, as the advances granted since August, 1914, are inadequate to meet the demands up to the present, and also to bring them on more of an equal basis with other employers of labour; and (3) that this advance shall become operative as from the date of receiving the petition. On Nov. 22, the Secretary of the Union asked that there should be included in the arbitration all the women now employed, consumers' ledger clerks, clerks in the fittings department, male and female attendants in the show-rooms, drivers and shunters of small locomotives at Granton, and all who came under the last award. At the hearing, a special claim to consideration was advanced on behalf of the workers in the toluol and benzol department.

The principal grounds put forward in support of the application were: (1) The increased cost of living; and (2) the contention that the advances granted by the Committee on Production to certain grades of workmen had excited serious discontent among those employees who had not received them, and that the distinction between skilled and unskilled labourers was untenable in present conditions, and had been disregarded in recent awards. It was pointed out by the representatives of the Commissioners that the figures given in the "Labour Gazette" showed that the increase in the cost of living since July 27 (the date of the last award) had been at most only fractional, and that the action of the Food Controller was tending to reduce the cost of the prime articles of food. Stress was also laid on the advantages enjoyed by employees of the Commissioners over and above their wages.

The Arbitrator has decided that the war bonuses at present paid to those workmen who were affected by the award of July last shall, in cases where they do not equal or exceed that sum, be raised to 12s. per week as compared with pre-war rates; the alteration to come into effect from and after the first full pay following the issue of the award. This shall not operate to reduce any wages or bonuses at present paid. To the shunters and drivers of the small locomotives at the gas-works, he awards an advance of 2s. 6d. per week. The Arbitrator does not include the women workers, as their remuneration is regulated by statutory rules and orders issued by the Ministry of Munitions (which have been observed by the Commissioners); and he also finds that the claim made by the Union for the inclusion of the consumers' ledger clerks, the clerks in the fittings department, and the attendants in the show-rooms has not been established. Finally, he holds that no case has been made out for a special advance to the men employed in the production of toluol and benzol.

The award has not pleased the men, for on Thursday night a mass meeting was held, when, after discussing the various points, the men decided not to accept it. The view was expressed that the Commissioners had received all they desired, and that the men were left to accept the lowest possible fraction of their claim. It was stated that the men's position had not been fairly considered, as, out of the seven points in the award, five were favourable to the Commissioners, and the two granted to the employees could not have been less without cutting them away altogether. The men stated their willingness to meet the Commissioners in conference with a view to a settlement; and if this was not reached by 6 a.m. on Saturday, they would adhere to their former resolution to stop work. What can be said of men who agree to arbitration, and then decline to abide by the result?

Representatives of the men conferred on Friday afternoon with some of the Commissioners, and, as a result of this, a mass meeting was held the same night, at which it was decided to send a deputation to confer with a full meeting of the Commissioners on Monday (yesterday) afternoon. Failing a settlement then, the men are to "down tools" as from this (Tuesday) morning.

NOTTINGHAM GAS-WORKERS AND THE GOVERNMENT AWARD.

Judging from the controversy which has arisen in relation to the interpretation of the terms of the award recently given by the Committee on Production, as to the wages of gas-workers and others engaged in the municipal service, the old aphorism regarding the possibility of driving a coach-and-six through any Statutory Enactment may have to be extended so as to apply to decisions affecting remuneration in war-time. The findings of the Commissioners have given rise to trouble, either through the inexact phraseology of the document in which they are embodied or a failure to grasp their true tenor. According to the interpretation, as first accepted by the chief officers of the Municipality, the decision was likely to saddle the Corporation with further increased expenditure of £20,000 annually in wages; but if the men's contention in respect to a vital point is conceded, the amount is likely to be very substantially augmented.

The matter has been raised by Mr. Habgood, acting locally on behalf of the Unions concerned, he having communicated with the Committee on Production stating that the award was only part of what it should be, as certain employees had been omitted. It was laid down in one paragraph of the document that a man over 18 should receive such an amount as would make his extra war wage 2s. a day on shift work; Mr. Habgood's commentary upon this being "I take it if he works eight shifts he would be entitled to 16s., or if he works only five shifts he would only be entitled to 10s. war wage." It was also pointed out by the writer that the previous war bonus under this award was converted into war wages, and should be taken into calculation for the payment of overtime. It was asked, therefore, whether each employee who had been paid time-and-a-quarter and time-and-a-half for extra shifts would receive extra war wage at the corresponding rate for extra shifts worked. It was urged on behalf of the workmen—and this is the *crux* of the matter—that the extra special advance of ½d. which had been granted (in addition to war bonuses of 7s. and 9s. a week respectively conceded to different sections of workers since the outbreak of hostilities) was not taken into consideration by the Commissioners as a war wage in making their award, but that the award was based on the previous war bonus granted of 9s. and 7s. A ruling upon the point was asked for.

Replying to the inquiry, the Secretary of the Committee on Production had written stating that a man who worked eight shifts would be entitled to 16s.; and that in the case of men who had previously been paid time-and-a-quarter and time-and-a-half for extra shifts, these additional payments were to be paid upon the 2s. The special advance of ½d. per hour was not to be taken into account in the calculation of the 12s. mentioned in the first clause of the award.

The Town Clerk (Mr. W. J. Board), at last week's meeting of the Council, observed that the interpretation now put upon the award was not, in his view, what the award, as drawn, meant, though it might be what the Committee intended. So far as the omission of the water employees was concerned, it was due to a clerical error.

In view of the importance of the matter, it was referred to a Special Committee of the Council, who have since decided upon further important action, with a view to the elucidation of the points involved. Meanwhile, gas workers in particular are complaining, in most instances, that the award is inadequate to the increased cost of living under war conditions.

GAS FOR MOTOR VEHICLES.

Particulars as to Gas Supplies.

The following list, appearing in the "Commercial Motor" for the 6th inst., has been compiled by the British Commercial Gas Association of places where, for the present, a demand for gas for motors would be embarrassing, and of others where such a demand would be welcomed.

LIST OF UNDERTAKINGS WHERE A DEMAND FOR GAS FOR MOTORS WOULD, AT PRESENT, BE EMBARRASSING.

London and Suburbs (excepting South Metropolitan), Barnet, Beccles, Cambridge, Chester, Colchester, Coventry, Dudley, Dumbarton, Durham, Grantham, Gringley, Harrow, Hemel Hempstead, Ipswich, Langley Mill, Leamington, Liverpool, Llandudno, Maidenhead, North Middlesex, Paisley, Prescot, Radcliffe, Reading, Salisbury, Selby, Sheffield, Sunderland, Torquay, Warrington, Widnes, Wolverhampton.

LIST OF UNDERTAKINGS WHERE A DEMAND FOR MOTORS WOULD BE WELCOMED, PROVIDED COAL AND LABOUR ARE FORTHCOMING.

Aldershot, Annfield Plain, Ascot, Ashford, Basingstoke, Bath, Belfast, Bideford, Birkenhead, Birmingham, Blackburn, Brentford, Bristol, Buxton, Chertsey, Clevedon, Commercial, Congleton, Croydon, Dartford, Deal, Devonport, Doncaster, Drighlington, Dublin, Dunfermline, Eastbourne, East Hull, Exeter, Exmouth, Gainsborough, Glasgow, Gorleston, Hastings, Hebden Bridge, Herne Bay, Heywood, High Wycombe, Hinckley, Holyhead, Hull, Ilford, Ilfracombe, Inverness, Johnstone, Kildwick, Lancaster, Lea Bridge, Leicester, Lewes, Malvern, Merthyr Tydvil, Newbury, Newcastle, Newport (Mon.), Northwich, Ormskirk, Oxford, Paignton, Pembroke Dock, Pinner, Pontypridd, Port Glasgow, Portsmouth, Rochester, Chatham and Gillingham, Romford, Rowley Regis, Rugby, Ryde, Mid-Kent, Stoke-on-Trent, St. Andrews, Salford, Shrewsbury, Southampton, Spalding, Spenborough, Swansea, Stretford, Tottenham, Tynemouth, Wakefield, Walton-on-Thames, Wath-on-Dearne, Windsor, Worcester, York, Yorktown and Blackwater.

LIST OF UNDERTAKINGS WHERE A DEMAND FOR GAS FOR MOTORS WOULD BE WELCOMED.

Aberdeen, Abertillery, Accrington, Arbroath, Ashbourne, Ashton, Bangor, Barnoldswick, Batley, Beverley, Bishop Auckland, Blyth, Bolton, Bothwell and Uddingston, Bournemouth, Bradford, Bridgwater, Brighouse, Bridlington, Broadstairs, Burnley, Burton-on-Trent, Cambuslang, Cannock, Cardiff, Carlisle, Cheltenham, Chesterfield, Chichester, Chorley, Cirencester, Clacton, Claycross, Cleethorpes, Clitheroe, Coatbridge, Colne, Colwyn Bay, Cowdenbeath, Darlington, Darwen, Devon Gas Association, Dewsbury, Dorking, Dundee, Dunoon, Edinburgh, Falkirk, Fleetwood, Glossop, Greenock, Gt. Grimsby, Guildford, Halifax, Hamilton, Hartlepool, Haslingden, Hawick, Haywards Heath, Heckmondwike, Helensburgh, Hexham, Hitchin, Hornsey, Huddersfield, Irvine, Keighley, Kidderminster, Leeds, Leigh, Leyland, Lincoln, Lisburn Littleborough, Littlehampton, Llanelly, Londonderry, Longwood and Slaithwaite, Lurgan, Luton, Lytham Macclesfield, Maidstone, Malton, Manchester, Mansfield, Market Harborough, Matlock, Middlesbrough, Mirfield, Morecambe, Mossley, Motherwell, Neath, Nelson, Newark-on-Trent, Newcastle-under-Lyme, Newport (Isle of Wight), Normanton, Northampton, Norwich, Nottingham, Oldham, Padiham, Perth, Plymouth, Preston, Ramsgate, Rawmarsh, Redhill, Rhyl, Riddings, Rochdale, Rossendale, Runcorn, Rushden, St. Albans, St. Helens, Seaham Harbour, Sevenoaks, Shipley, Sittingbourne, Skipton, Southend, South Metropolitan, Southport, South Shields, Stalybridge, Stratford-on-Avon, Sutton and Hooton, Swadlincote, Swinton, Tamworth, Todmorden, Tonbridge, Tredegar, Tunbridge Wells, Tyldesley, Vale of Leven, Waddesdon, Wallasey, Wellingborough, Weston-super-Mare, Weymouth, Wigan, Winchester, Wolstanton, Wombwell, Workington, Wrexham, Yeadon and Guiseley.

Mr. E. S. Shrapnell-Smith, Economy Officer to H.M. Petroleum Executive, has resigned the chairmanship of the Fuels Committee of the Commercial Motor Users' Association, upon which Committee the British Commercial Gas Association and the National Gas Council are represented, on his appointment to the Government's Inter-Departmental Committee on Gas Traction, of which he is also Secretary *pro tem.* The Fuels Committee are already engaged upon the preparation of data and evidence, with a view to their submission to the Government Committee. Mr. Sidney Garcke (Managing-Director of the British Automobile Traction Company, Ltd.) has been elected Chairman, and Mr. Walter Wolsey, jun. (Managing-Director of Thomas Tilling, Ltd.), Vice-Chairman of the above-mentioned Civilian Committee, of which Mr. Frederick G. Bristow, F.C.I.S., No. 83, Pall Mall, is the Secretary.

The Barrow-in-Furness Gas Committee have had to inform applicants for gas for motor vehicles that, while they are in full sympathy with the project, they regret that, owing to circumstances over which they have no control, they are unable at present to supply the gas required. They will, however, be prepared to give the matter due consideration as soon as they are in a position to do so.

The South Metropolitan Gas Company have notified the Lambeth Guardians that the Directors regret that, in consequence of the further increased cost of fuel and freightage, it has become necessary to raise the price of coke at the Company's works to 31s. 8d. a ton unbroken, and 33s. 4d. broken. These increases represent an addition of 3s. 4d. on previous prices. The charge for delivery remains at 6s. 8d. a ton.

¶ *Whatever heat-treating proposition is under consideration, there is a "Richmond" Furnace to suit the class of Work.*

A Modern Hardening Shop.

Equipped with "Richmond" Gas Furnaces for the speedy and efficient manufacture of tools of all kinds.

In the gigantic task of manufacturing sufficient tools of all kinds for the production of Munitions and War Materials, the careful heating of high-speed steel to critical temperatures forms a very vital part.

The success associated with "Richmond" Gas Furnaces for this work is demonstrated in every engineering sphere, and the exclusive advantages embodied in "Richmond" plant is constantly leading to recommendation within the Industry.

We will gladly co-operate in approaching any Firms in your district who use Heat and, if necessary, arrange for prospective clients to visit Works where "Richmond" Furnaces may be seen under actual working conditions.

Illustration shows "Richmond" Furnaces at a large Midland Factory for Hardening Cutters, Reamers, Lathes and Planing Tools, Broaches, etc.

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AMSTERDAM MUNICIPAL GAS-WORKS.

Report for the Year 1916.

Up to the end of November, 1916, the sales of gas by the Amsterdam Municipal gas undertaking showed an increase of 3·14 p.ct. as compared with the same period in 1915; but the regulations made by the Government in consequence of the coal crisis had such an effect that the decrease during December caused the total increase for 1916 to fall to 0·75 p.ct. Ever-increasing difficulties in the supply of coals and other raw materials, leading to rapidly increasing prices, have largely influenced the working costs; while the revenue from bye-products only to a small extent off-set the higher outlay. The transition of the Western works from the horizontal to the vertical retort system has been considerably delayed through the shortage of material. The foundations have, however, been completed; and as much of the other material has arrived, there is hope of regular progress being made.

Of the total quantity of coal carbonized, nearly one-half was British, and more than one-half was Westphalian—there being only a small quantity of Dutch and Belgian coals used. The production of gas per metric ton of coal varied in the case of the four works from 10,350 c.ft. to 12,800 c.ft. The total output of gas was 3,872,082,063 c.ft., of which the Southern works contributed the largest proportion. The consumption of fuel in carbonization was 0·169 ton of coke per ton of coal; while the total coke production amounted to 68·21 p.ct. of the coal carbonized, or excluding the breeze to 48·98 p.ct. Of the total quantity of gas made, 22·41 p.ct. was carburetted water gas.

The total number of ordinary meters in use increased 187, to 50,886; and the average consumption per meter was 33,888 c.ft. The number of prepayment meters increased from 79,057 to 82,025; the average consumption being 19,238 c.ft. The total consumption by prepayment meter was 46·24 p.ct. of the gas sold. The highest consumption registered by a prepayment meter was 111,548 c.ft. The average consumption per head of the population, without taking into account the gas used for public lighting, was 5293 c.ft.

The price of British coal at the works was 34s. 10d. per metric ton. The net profit per 1000 cubic metres of gas sold was 2s. 5d., compared with £1 4s. for 1915.

Association of Local Authorities.—The Exeter City Council have decided to join the Association of local authorities not owning gas undertakings, in order to safeguard their interest, and that of those they represent, in all matters appertaining to gas supply, and in the changes now taking place in connection therewith. The Council are willing that the expense incurred should be borne by the authorities in proportion to their rateable value, and approve of the appointment of a Committee to take all such steps as they may deem necessary to present the Association's case in regard to the standard price of gas to the Board of Trade, the Fuel Research Board, or Parliament.

NOTTINGHAMSHIRE COAL AND GAS PRODUCTION.

Nottinghamshire's resources in relation to coal production, with particular reference to its utilization in the manufacture of gas and the generation of electricity, were referred to at a meeting of the Nottingham City Council on Monday of last week, when a resolution was adopted appointing a Committee to consider the details of the scheme now being prepared by the Government for the better employment of available coal throughout the country—more especially for the generation and distribution of electricity from a limited number of central stations.

Mr. A. R. ATKEY, in moving the resolution, complained that under existing conditions many valuable products from the coal were being sent into the air, to the certain pollution of the atmosphere in a manner which cannot fail to be prejudicial to health. The Government had at last awakened to the needs of the situation; and therefore it was that he suggested the appointment of a Special Committee to consider the question in all its bearings. He had been advised by well-informed friends in London that for some time the utilization of coal with greater economy had been engaging the attention of the Government and of mining engineers whose expert advice had been obtained. The matter was one which concerned the Gas Committee of the Corporation as much as the Electricity Committee. He was not at liberty to divulge as much of the information as had come to his knowledge; but he might say he had been led to understand that the Government would take a favourable view of, and give a certain amount of preference in their schemes to, those municipalities who woke-up to the possibilities of the case and offered the Government their co-operation and assistance. The proposed Committee would have no power to exercise executive functions, but would be established to form a necessary means of communication between the Government and City authorities in regard to any scheme which might be evolved.

Mr. H. G. FORD (Vice-Chairman of the Gas Committee) alluded to the extensive use which has been made for many years in Germany of the bye-products of gas-works; urging that after the war the strictest care must be exercised to see that this country did not revert to the plan of parting with valuable materials, of which, under skilled direction, remunerative use might be made at home.

The MAYOR said the matter was one which had been in his mind for a long time; and he suggested that a practical purpose would be served if the Committee were empowered to obtain the advice of those outside the Council whose technical knowledge would aid in a solution of the problem.

This suggestion was adopted, and a Committee was appointed, including Mr. Alderman Ball (the Chairman of the Gas Committee) and Mr. Ford.

WAR WORK

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SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 10.

The tar products market in London is steady, but without any new feature. When official prices were fixed recently for tar oils, prices were also named for mixtures of creosote and pitch for fuel purposes in varying proportions. For this calculation pitch is evidently reckoned at about 30s. per ton *ex* works; and while this value may be acceptable to Provincial makers, it is quite inadequate to London manufacturers. Products generally are unaltered.

Sulphate of ammonia continues in good demand for home agriculture at the official prices.

Tar Products in the Provinces.

Dec. 10.

The average values for gas-works products during the week were: Gas-works coal tar, 26s. 9d. to 30s. 9d. Pitch, East Coast 20s. to 25s. per ton; West Coast—Manchester 18s. 6d. to 19s. 6d., Liverpool 19s. 6d. to 20s. 6d., Clyde 19s. 6d. to 20s. 6d. nominal. Benzol, 90 p.ct., North, 10½d. to 11¼d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 3s. 6d. to 3s. 8d. Heavy naphtha, North, 1s. 8d. to 1s. 10d. Creosote, in bulk, North 3¾d. to 4¼d. Heavy oils, in bulk, North 4¼d. to 4½d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s. to 90s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is very little change to note in markets during the past week. The increased Government requirements gradually lessen the private trade; and it would appear that, as time goes on, business must become more and more restricted and difficult. Cresylic acid, which is one of the rare free markets in which trade can be conducted under something like natural conditions, is very firm and in good demand at up to 2s. 9d. per gallon, with a tendency to improve further. Nothing is doing in creosote, apart from official business; and very little is heard of heavy oils, which are practically taken over. Solvent naphtha remains firm at up to 4s. 6d. per gallon, both for spot and forward delivery during the first six months of next year; but Provincial centres report some irregularity. Heavy naphtha is in good demand at up to 3s. 3d. per gallon. Refined naphthalene still finds a good export inquiry, and makes from £30 to £35 per ton; while crudes range from £5 10s. to £6 per ton for lower grades, which are particularly wanted in the fire-lighter industry, up to £14 to £15 for the better qualities. London pitch remains at 48s. per ton f.o.b., with 50s. asked in many instances. The Provincial position remains firm, although accumulated stocks are not decreasing. There is undoubtedly a good export demand; and the only obstacle in the way of its being executed is the continued shortage of shipping facilities. The cost of transport by rail to London, in order to obtain the higher price there, would probably absorb the difference in values, even supposing railway facilities could be guaranteed. Makers are, nevertheless, holding out for their prices, justifying their action by pointing to a better home demand and the further demands which are expected to accrue from the blending of pitch with fuel oil. Time alone can prove whether their point of view is the right one. It is certain, however, that if present conditions continue much longer, and if accumulated stocks do not soon begin to move off, a position of considerable difficulty must arise. In Manchester already this seems to be realized; for pitch is obtainable there in bulk at 20s. per ton. This district, however, lacks large patent fuel works which obtain in many other centres. Aniline oil is quiet without material change. The range of quotations is as follows:

Aniline Oil (pure): 1s. 2d. per lb.

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. 6d. per gallon; crystals 40% 1s. 3d. per lb.

Crude Tar: London 28s. to 32s., Midlands 25s. to 26s.; North 26s. per ton, *ex* works.

Pitch: London 48s. to 50s. f.o.b.; East Coast, 23s. to 26s. f.o.b.; West Coast—Liverpool 22s.; Manchester 22s. to 23s. f.a.s., Clyde 22s. to 24s.

Solvent Naphtha: Naked London 90-190% 3s. to 3s. 3d.; North 2s. 9d. to 3s. per gallon; 90-160% naked London 4s. 3d. to 4s. 6d.; North 4s. to 4s. 3d. per gallon.

Crude Naphtha: Naked 30% 8¼d. to 8½d.; North 6½d. to 6¾d.

Naphthalene: Refined £32 10s. to £35; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4¼d.; North 3¾d.; heavy oil, 4¼d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 2s. 7d.; 97-99%, 2s. 8d. to 2s. 9d. *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

The demand for this fertilizer is excellent; the fixed prices current being very attractive to consumers, even those for next year. There is some talk of an increase in the price of sulphuric acid, in which event makers could bring considerable pressure to bear with a view to in-

Gas Furnaces under Working Conditions

¶ The Davis Furnace Company have established at their Luton Works a completely equipped Exhibition Room for the practical demonstration of their various types of Gas-fired Furnaces (Town's Gas, High Pressure Gas, and Air Blast).

¶ Appointments to visit are cordially invited.

The Davis Furnace Company, Diamond Foundry, Luton

(Proprietors: The Davis Gas Stove Co., Ltd.)

creased prices at the next fixing, especially as, even now, their pre-war margin of profit has disappeared, and the export trade is dead—for the time being, at any rate. The future position remains very obscure. In order to conserve trade not permanently lost, propaganda abroad will be necessary; and it is conceivable that a proper export sales organization might improve matters after the war. At present, sales are made through the Association; and the method works well. The only trouble is with regard to price; some extraordinarily low values having lately been recorded. But during the war a number of factors bear upon price which, when peace comes, will have no effect; for the law of supply and demand will once more come into operation. Recent developments prove that trading in this product will become exceptionally keen; and any sales organization which can simplify, and at the same time cheapen, the carrying on of the export trade is sure of a hearty support from manufacturers. The interim report of the Nitrogen Products Committee, referred to last week, provides much food for thought regarding the post-war trade in both tar and ammonia products; and there is also much of interest to the gas industry. A thorough inquiry, it seems, has been made as to the possibility of cheapening the production of electric power from coal, not only by its generation in bulk with the most modern plant, but also by carbonization and gasification with recovery of ammonia, fuel oils, and other bye-products. Very important developments are foreshadowed; and manufacturers of sulphate cannot afford to ignore them, in view of their bearing upon the future of the trade.

Failure of the Spalding Gas Supply.—The Spalding Urban District Council have determined to raise the price of gas 3d. per 1000 c.ft., making an increase of 8d. for the present year. At the meeting at which this decision was reached, questions were raised as to a recent failure of the gas supply to the town; the Manager stating that it was due to a breakdown at the works. He had warned the Military Tribunal at the time that the gas supply would suffer if they took the best men away from the works; and he had also warned the Council that the gas supply for the winter would be prejudiced if the vertical retorts were not repaired.

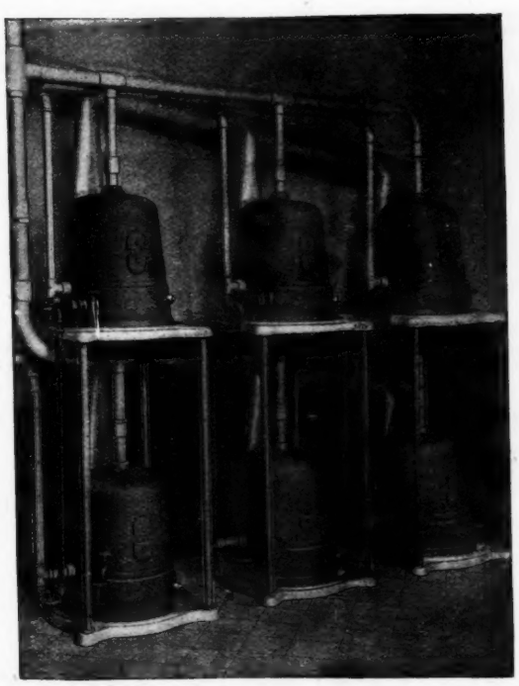
Street Lighting in Bethnal Green.—The Bethnal Green Lighting Committee report that they have had under consideration an application from the Commercial Gas Company with regard to proposed new rates for public lighting. These rates were considerably in excess of those at present existing; and the Company agreed, if the two, three, and five burner lamps are reduced to single-burner lamps, to charge for such lamps at the same rate as for ordinary single-burner lamps. Further, they are willing to reduce the proposed rate of £2 18s. for a single-burner lamp by 1s. per annum. By this arrangement, taking into account the proportion of lamps at present out of lighting, a saving of nearly £40 per annum will be effected, without any serious diminution of lighting; and the Committee recommend the adoption of the course suggested.

Yorkshire Gas Price Increases.

The Batley Town Council have approved a recommendation by the Gas Committee, advancing the price of gas for lighting 6d. per 1000 c.ft., and 8d. for power, making present charges 3s. 11d. and 3s. 7d. respectively. The Mayor (who is Chairman of the Gas Committee) said that, owing to lighting restrictions and the Summer Time Act, the local consumption had decreased by 36½ million c.ft. in the past two years; and, bearing in mind the advanced cost of coal and wages increases, there would be a deficiency estimated at £2900 if the price were not advanced. The increase, as it was, left no margin of profit. The Bradford Gas Committee recommend the increase of gas prices for all purposes 5d. per 1000 c.ft., as from the date of the meter readings at the end of the present year, existing discounts to continue to operate. The Committee also recommend that the Town Clerk be authorized to protest to the Coal Controller against the 2s. 6d. advance in coal prices, retrospective to Sept. 17, being applied to gas undertakings, and to urge that coal supplied to gas-works be brought into line with that for house purposes, and the increase date only from Oct. 15. The Filey Urban District Council have resolved to advance the price of gas 2d.—except in the case of prepayment meters—making the charge 4s. 6d. per 1000 c.ft. The change operates from Jan. 1. This brings the advances in the cost of local gas to over 1s. per 1000 c.ft. since the war began. The Gomersal Gas Company have advanced the price of gas 5d. per 1000 c.ft., owing to cost of coal, carting charges, and wages. In regard to slot meters, there is a proportionate reduction of the quantity supplied for a penny. The change operates from the meter reading for the quarter ending Dec. 31. The Halifax Corporation have approved the Gas Committee's recommendation of an advance of 3d. per 1000 c.ft. on all gas except that supplied through slot meters, which is increased 5d. per 1000 c.ft. The increase was stated by Mr. J. H. Waddington (the Chairman of the Committee) to be due solely to the increased cost of coal. He reported that the 2s. 6d. per ton advance is costing Halifax £5625, while the 3d. advance in gas charges will produce only £3400. The Swinton and Mexborough Gas Board have intimated an advance of gas charges, to meet the cost of coal and materials, of 6d. per 1000 c.ft., as from the next meter reading. The Ossett Gas Committee have increased the price 6d. per 1000 c ft.

In Gratz, the capital of Styria, the population of 150,000 is, says "The Times," entirely without gas, having exhausted the stocks of coal.

At Wath-on-Dearne, there has lately been an active demand for public lighting for the benefit of colliers going to and from work in the night; but the Wath, Bolton-on-Dearne, and Thurnscoe Gas Board have had to reply that, owing to inadequacy of plant and material, they are unable to manufacture more gas than will serve for private lighting. They appeal for strict economy in domestic consumption.



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"ACMEFONTS" can be used singly or in groups as shown. They are convenient, clean, simple in operation, and gas consumption is economical.

For Hard-Water Districts, troubles of lime deposits on internal metal parts of boilers are minimised by our special "NON-CRUST" treatment, which is applied without extra charge.

Please write us for full particulars,

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Coal and Gas Prices at Stafford.

The Stafford Town Council have decided that, in consequence of the considerable increase in the expenditure of the department owing to the advance in the price of coal and other materials, and also of labour, the price of gas be increased by 6d. per 1000 c.ft. to ordinary and prepayment consumers, and by 3d. per 1000 c.ft. to consumers for power. The Chairman of the Gas Committee (Mr. Barton) said the Gas Engineer estimated that the extra cost of coal would be £3000; but had it not been for the enterprise of Mr. Valon this figure would have been nearer £4000. Alderman Westhead mentioned that the rise in the price of coal was being paid as from September last; so that it would be a heavy charge on the department. The estimated increased expenditure in the Gas-Works Department for the second half of the year was about £5600. The new rise in the price of gas would yield roughly about £5000; so that there was no question whatever of exploiting the gas consumer or making a profit merely for the sake of paying 5s. in the pound income-tax. With regard to residuals, it was not the Committee's intention at present to increase the charges for coke. The price had not been advanced for the last two or three months; so that the additional amount they were called upon to pay for coal would not be returned to them out of the sale of coke.

Leeds War Bonus.—The Leeds General Purposes Committee have agreed to advance the war bonuses of Corporation employees from 9s. to 15s. per week for men, and 12s. for women. The advance concerns all those receiving less than £250 a year, except some trade unionists with whom other arrangements have been completed.

Gas Light and Coke Company's Price.—The Gas Light and Coke Company announce that, in consequence of the further greatly increased cost of coal, oil, freights, labour, and every class of material employed in connection with gas making and distribution, they are compelled to increase the price of gas in their district north of the Thames from 3s. 4d. to 3s. 10d. per 1000 c.ft., as from the reading of the meters in December.

Price of Gas at Barrow.—After considerable discussion, the Barrow Town Council, on Monday of last week, decided, by fourteen votes to seven, to increase the price of gas from 3s. to 4s. per 1000 c.ft. The opposition suggested that greater co-ordination was required between the management and the workmen; but this was denied. Alderman Neal and Mr. A. Brown (the Chairman and Vice-Chairman of the Gas Committee) pointed out the tremendous difficulties which had had to be faced by the management in meeting the extra needs for gas from the old plant, followed by the coal difficulties in regard to prices and quality. At the same meeting, it was reported that Yorkshire coal was again available for the new branch works at Salthouse, and that more gas was being obtained from the Durham coal by increasing the temperature.

Price of Gas at Peterhead.—The Peterhead Town Council, after hearing a statement from the Manager regarding the increase in the cost of coal, and its cause, decided that the price of gas for consumers by ordinary meter shall be raised 4d. (to 5s.) per 1000 c.ft.

Todmorden Dispute Settled.—The threatened trouble at the Todmorden Corporation Gas-Works, owing to the bulk of the men demanding that the foremen should join their union, or work would be stopped, was settled last week by the foremen giving way before the pressure of the exponents of trade union "liberty of the subject."

Wages at Keighley.—The Keighley Corporation have adopted a recommendation of the War Bonus Committee that payment for overtime be made on the basis of wages and war bonus; that deductions for absences, from whatever cause, be made on the same basis; and that no overtime be paid until the full number of ordinary working hours per week were worked.

Higher Wages at Batley.—The Batley General Purposes Committee have advanced the Gas Department employees' wages as follows: Stokers, 5s. to 5s. 9d. per shift, *plus* 1s. 4d. per shift war bonus; blacksmith, 10½d. per hour; assistant blacksmith, 9½d.; meter fitters, 10½d.; main and service layer, 10½d.; meter repairer, 11d.; labourers, 9d.; boiler and enginemen, ½d. per hour increase on present wages.

A Large Consumer for Burton.—The Burton-on-Trent Corporation Gas Committee have considered an application from the Ministry of Munitions for a supply of gas to a new munitions factory; the demand applied for being a continuous supply of high-pressure gas for furnace heating, which may average about 400,000 c.ft. per day, with a maximum demand for 40,000 c.ft. per hour at busy hours of the day, with a 10 p.c.t. margin. The estimate submitted by the Gas Manager (Mr. R. S. Ramsden) for providing the supply totalled £9500. The Committee approved the scheme.

Local Authorities and Gas Companies.—Reporting upon proposals made at the conference of representatives of gas undertakings to secure some relief from financial hardships resulting from the war, the General Purposes Committee of the Marylebone Borough Council state: "At the present time the greater part of the additional cost due to war conditions is being borne by consumers; the shareholders bearing only one-seventh. The undertakings now seek to secure that such increased cost shall be borne by the consumers in a greater degree. The representatives of the gas companies are, it is understood, making to the Board of Trade representations which, if allowed, would result in the companies transferring to consumers 80 p.ct. of the one-seventh of the additional cost at present borne by shareholders. The companies are urging, in support of their claim for an amendment of the sliding-scale, the ground of financial hardship; but under the existing arrangement, which was in the nature of a bargain between consumers and shareholders, the companies in the past have been able to distribute in dividends several millions in excess of the sums they could otherwise have paid. We are of opinion that the attempt of the companies now to alter these conditions in their favour should be strenuously resisted."

Laboratory Meters - - -

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Benzol Recovery at Chertsey.

Reference was made to the effect of the steps taken for the recovery of benzol at the Chertsey Gas-Works, in the course of the proceedings at the recent annual meeting of the Company. It was stated that the output of gas had increased 20 p.ct., and that the returns from residuals had been satisfactory. The payment of statutory dividends, less income-tax, on all classes of shares was recommended. In reply to a shareholder, who asked if there had been any complaints as to the quality of the gas, the Chairman (Mr. W. Moir) said there had been a few, which were due to inferior coal, and to a request from the Ministry of Munitions for benzol. Mr. F. G. Matthews (the Engineer and Manager) mentioned that an official from the Ministry had expressed satisfaction with the quantity of benzol produced—1·7 gallons per ton of coal carbonized—but, if possible, would like it increased to 2 gallons per ton. This could easily be done if the consumers would be content with a lower quality gas. Another shareholder expressed the opinion that the Government should have the benzol, and the consumers do with less light. It may be mentioned that the benzol plant has been in operation about six weeks, and is so far working very smoothly and giving good results. The Company have produced 2¼ gallons per ton of coal, but were obliged to reduce this owing to complaints. The quality of the gas can be regulated by adjusting the oil-tap at the washer. The plant is mostly of second-hand material, and was designed by, and installed under, the supervision of Mr. Matthews, with direct labour. A Hird-Chambers dehydrating plant is adapted for de-benzolizing, and is doing the work well. The workshop being close at hand, the operator fills in his time on repair work. Mr. Matthews has been given a well-deserved increase of salary.

Price to be Increased at Oldham.—It has been decided by the Oldham Gas Committee to recommend the Council to increase the price of gas from 2s. 11d. to 3s. 5d. per 1000 c.ft., subject to the usual discount of 6d. if paid within a stipulated time.

Nelson and the New Coal Price.—Attention was drawn, at last week's meeting of the Nelson Town Council, by the Chairman of the Gas Committee, to the resolution of the Committee expressing disapproval of the action of the Coal Controller in increasing the price of coal already purchased and partly consumed, and recommending an increase in the price of gas in order to meet the greater cost of materials and the advance of wages. He said the action of the Coal Controller meant an additional expenditure of £2000; and on the top of this a further increase of wages had to be considered. A penny per 1000 c.ft. would bring in about £500; so that it would be seen that gas would have to go up not less than 4d., and possibly 6d. The Council passed the recommendation of the Committee to fix the price of gas from Jan. 1 at a rate which will cover the increased cost to the department.

Lanark Middle Ward Gas Purchase Proposal.

Consideration has again been given by the Middle Ward District Committee of the Lanark County Council to the question of purchasing the gas undertakings in their area. A minute of the Sub-Committee on Gas Supply stated that in 1915 the Treasury expressed the opinion, in reply to the Clerk to the Committee, that expenditure of such a nature should be postponed in the then existing circumstances. The Chairman of the Sub-Committee had now stated that he had thought it desirable that the Committee should consider whether, in view of the time which had elapsed since the matter was last considered, and in view of the probability that the war might not terminate for some considerable period, the Government Departments should be asked to re-consider their attitude. He reminded the meeting that at the present time the District Committee had no control over any of the gas undertakings, and that extensions or alterations might be made to the ultimate prejudice of the Local Authority. He further stated that he understood some of the smaller undertakings were not in a position to utilize to the full extent the bye-products from their works; and that if they were acquired by the Local Authority, and if a centralization of operations were brought about, an improvement in this respect might be secured whereby the supply of the chemicals so much needed by the Government for high explosives could be considerably increased. It was agreed that the Clerk should again communicate with the Treasury on the subject, and inquire whether they were favourably disposed to negotiations being opened with the companies in the district, or some of them. By a large majority, the Committee approved the action of the Sub-Committee.

Municipalization Question in Adelaide.—The report of a Royal Commission appointed to inquire whether it is advisable to municipalize the gas and electric services of Adelaide has been laid before Parliament. It is said that the inquiry revealed no serious grievances. The municipalization of the South Australian Gas Company's undertaking is disapproved; but it is considered advisable that amending legislation should be introduced on the lines of the English Model Gas Bill and the New South Wales Gas Act of 1912, and that for the purposes of such legislation the standard price of gas should be fixed after inquiry by a Judge of the Supreme Court or the President of the Arbitration Court. According to the basis of purchase—whether 20 or 25 years' profits—it would cost £1,000,000 or £1,230,000 to acquire the property of the Gas Company. As the evidence disclosed no substantial ground of complaint against the Company in their dealings with their 26,000 customers, the Commission view with disfavour a municipalization which would be so expensive that the price of gas would have to be increased. The Commission do not find that the price of gas in Adelaide is excessive; but they hold that there was enough evidence before them to justify the recommendation for a full judicial inquiry under the proposed amending legislation to fix a standard price.

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Wages Question at Leicester.—The Leicester Town Council have approved the report of the Special Committee with respect to the payment of war bonuses and allowances to employees according to the award of the Committee on Production. A recommendation of the Gas Committee that time-and-a-half be paid to all shiftmen doing Sunday work was carried.

Position of the Grangemouth Gas Undertaking.—It was alleged by members of the Grangemouth Town Council that the gas undertaking was not receiving the necessary attention from the Manager; and the Council accordingly called in Mr. George Keillor, of Greenock, to go over the whole works, and report on their condition. His report was considered at a special meeting of the Council last Tuesday. The Sub Gas Committee recommended that the Manager's attention should be drawn specially to several of the items in the report, and that he should be told exactly what results were to be expected from the works in future. Mr. White thought the Council should dispense with the services of the Manager; but Mr. Penny said that, though the expert's report showed that the works were not in the best condition, and last year's deficiency was £835, he thought if two months were given in which to get the works up to the proper standard the Manager might be able to do so. If not, then he would agree with Mr. White's motion. By a majority, Mr. Penny's proposal was adopted.

Price and Quality of Gas at Burnley.—The Burnley Corporation Gas Committee have had under consideration the extra cost of manufacturing gas, but have not made any change in the price, notwithstanding the heavy increased charges. At Wednesday's meeting of the Town Council, Mr. Sutcliffe called the Chairman's attention to the very low average candle power of the gas supplied, and stated that he had had over 150 letters from all over the town complaining of the state of the gas. It would be as well if the Chairman would make a statement. Mr. Grey: The Chairman might take into consideration the making of a statement that Mr. Sutcliffe is not the Manager of the gas-works. [Laughter.]

Newcastle-on-Tyne Gas Company's Bill.—A meeting has been held by the Finance Committee of the Corporation to consider the Bill for the modification of existing sliding-scale provisions which the Newcastle-on-Tyne and Gateshead Gas Company have given notice of their intention to promote. The question of municipalizing the gas supply of the city was raised; the opinion being expressed that the present would be a favourable opportunity for the Council seriously to consider the matter. In the end it was agreed to recommend the Council to appoint a Parliamentary Committee to deal with the Gas Company's Bill, and other Bills affecting the Municipality that may be promoted from time to time.

STOCK MARKET REPORT.

THE Stock Exchange has not had a brilliant or a cheering week. Business went "dead slow," and markets were in a moping sort of mood. It scarcely amounted to pronounced depression; but there seemed to be a general indisposition to buy just at present. Prominent among adverse factors Russian affairs naturally figured, as, although competent authorities believe in ultimate restoration, much mischief is being caused meanwhile. The War Bonds' merry week with Tank-aided collection also kept money out of the markets. So prices in general drooped, but not immoderately.

The gilt-edged division came off as well as any, and Home Government issues were fairly steady on the whole, though War Loan eased a bit. Home Rails were dull with the high cost of wages before their eyes. Similar views affected Americans, and Argentines were uneasy. The Foreign Market has presented various aspects. French showed a steady front, and Chilian and Japanese were firm; but exchange movements affected Scandinavian and Brazilian.

Business in the Gas Market was up to the mark in point of volume. Gas Light and Coke was adversely affected by the announced rise in price consequential upon heavily increased expenditure imposed upon the Company. But other companies similarly situated, who will have to raise their prices too, were not noticed. Changes in quotation were: A rise of 3 in Alliance and Dublin debenture, ¾ in Liverpool, and ¼ in Primitiva; a fall of 1 in Continental Union, 2 in Gas Light ordinary, and ⅛ in Primitiva preference. The Money Market was easy.

Bargains done for cash during the week were as follows: On Monday, Brentford "B" 76, Cape Town preference 7½, Gas Light ordinary 72, 72⅛, 72½, 72⅝, 72¾, ditto preference 70, Hastings and St. Leonards 49, 49½, Imperial Continental 91, Metropolitan of Melbourne 98⅜, 98⅛, 98½, Primitiva 35s., ditto preference 55s., South Metropolitan 76, ditto debenture 56, South Suburban 76½, ditto preference 76¼, Dartford 75, 75⅜, Gloucester 82¼. On Tuesday, British 32½, ditto debenture 68½, 69, Gas Light ordinary 72½, ditto maximum 57½, ditto debenture 56, 56¼, 56½, Imperial Continental 91½, Monte Video 8⅝, Primitiva 35s., 36s. 3d., ditto preference 52s. 6d., 56s. 10½d., South Metropolitan 76½, 76¼, Metropolitan of Melbourne ordinary 8⅞, 8¾, Harrow and Stanmore 83½, Worthing 77½. On Wednesday, Alliance and Dublin 55, British 33, Commercial 3½ p.ct. 65½, ditto debenture 54, European 10⅛, 11, Gas Light ordinary 71⅞, 72, 72¼, ditto debenture 56½, Imperial Continental 92, Primitiva 35s., ditto preference 52s. 6d., 53s. 1½d., 55s., 56s. 3d., Tottenham "B" 71⅜. On Thursday, Croydon "B" 167, 168, ditto "C" 164, 165, Gas Light ordinary 70, 70¼, 71⅛, Imperial Continental 91⅜, 92⅜, Metropolitan of Melbourne 99¼, South Metropolitan 76⅜, 76½, Hampton Court 70, 70⅜. On Friday, Commercial 4 p.ct. 71⅜, Continental Union 39, Gas Light ordinary 69¾, 70¼, 71, 71⅜, 71½, ditto maximum 57⅛, 57⅜, ditto preference 71⅛, Imperial Continental 91¼, 91⅜, Monte Video 8½, Primitiva 37s. 6d., ditto preference 55s., South Metropolitan 76, 76⅛, 76¼, 76½, ditto debenture 56⅜, South Suburban 76⅛, ditto preference 76½, ditto debenture 86⅜, Croydon "A" 200, 201.

The Bank rate is 5 p.ct., as fixed on April 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When last Dividend.	Ante-War Dividend & Bonus. p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref. .	..	57—62	..
1,551,868	,,	April 8	2½	4⅜%	Alliance & Dublin Ord.	59—64	52—57	55
374,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	60—65	..
280,000	5	April 29	7½	3/6	Bombay, Ltd.	5⅞—6⅛	5—5½	..
50,000	10	Feb. 26	16	14%	Bourne- 10 p.c. .	29—30	23—25	..
383,110	10	,,	7	7%	mouth Gas B 7 p.c. .	15—15½	10½—11	..
115,000	10	,,	6	6/-	and Water Pref. 6 p.c.	13½—14	9—9½	..
159,740	—	—	—	4%	4 p.c. Deb.	..	69—71	..
992,045	Stk.	Feb. 26	14	5⅛%	Brentford A Consolid. .	261—266	79—82	..
774,930	,,	,,	11	4⅛%	Do. B New . .	204—209	76—79	76
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	81—86	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb. .	91—93	65—67	..
217,380	,,	Feb. 26	11	10⅝%	Brighton & Hove Orig. .	208—213	145—150*	..
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—159	98—103	..
530 000	20	Mar. 26	12½	22/6	British	44—45	32—33	32½—33
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk. .	88—90	68—70	68½ 69
245.771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	53—56	..
100.000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	3—3½	..
100.000	10	—	—	4½%	Do. 4½ p.c. Pref. . .	4—6	6¼—7¼	7½
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	79—81	..
1,518,280	,,	Feb. 12	5/9/4	44/-	Commercial 4 p.c. Stk. .	106—108	70—72	71½
560 000	,,	,,	5⅓	40/-	Do. 3½ p.c. do. .	103—105	64—66	65½
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	54
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	39—41	39
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	61—63	..
278,400	—	—	—	11¼%	Croydon B and C 7 p.c..	..	165—175	164—163
—	—	—	—	10%	Do. E	..	..	..
493,270	Stk.	—	6	5⅜%	Derby Con. Stk. . . .	123—125	95—100	..
55.000	,,	—	4	4%	Do. Deb. Stk. .	102—104	80—83	..
1,002,180	10	July 29	10	5/0	European, Ltd. . . .	17½—18	10½—11½	10½—11
16.313.430	Stk.	Feb. 10	4/17/4	37/4	Gas 4 p.c. Ord. . .	98—102	69—71	69⅝—72⅜
2,600.000	,,	,,	3½	3½%	Light 3½ p.c. max. .	76—79	56—58	57⅝—57½
4,062,285	,,	,,	4	4%	and 4 p.c. Con. Pref.	96—99	70—72	70—71½
4,674 850	,,	June 11	3	3%	Coke 3 p.c. Con. Deb.	72½—74½	55—57	56—56½
180,000	,,	,,	10	10%	10 p.c. Bonds . .	..	..	..
258,740	,,	Mar. 12	5	3½%	Hastings & St. L. 3½ p.c.	87—89	48—53	49—49½
70.000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16½	7½—8½	..
86,600	—	—	—	9%	Hornsey 7 p.c. . . .	..	115—125	..
181,000	Stk.	Mar. 12	7⅞	7%	Ilford A and C. . . .	151—154	92—97	..
65,780	,,	,,	6⅜	5½%	Do. B	115—118	72—77	..
65.500	,,	June 26	4	4%	Do. 4 p.c. Deb. . . .	92—94	65—68	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	90—93	91—92⅛
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c. .	119—121	82—87	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A	211—213	..	..
					B	146—148	83½—84	..
306,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—73	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	3½—4	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	89—100	98⅞—99½
541,920	20	May 28	4	6/-	Monte Video, Ltd. . .	11½—12	8—8½*	8⅛—8½
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98½—99½	75½—76	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	61—63	..
55,940	10	Feb. 26	7/14/0	7%	North Middlesex 7 p.c. .	14—15	9½—10½	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	101—105*	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	2—3	..
60,000	50	Feb. 26	13	12%	Portsea, Island B . .	123—131	83—88	..
100,000	50	,,	12	11%	Do. C . .	118—121	73—78	..
52,000	50	,,	10	9%	Do. D . .	..	..	..
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	1⅞—2	35/- —37/6
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref. .	4⅝—5	2⅝—2⅞	52/6—56/10½
531,600	100	June 2	4	4%	Do. 4 p.c. Deb. .	91—93	76—78*	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb. .	85—87	59—64	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref..	10½—11	7½—8	..
125,000	50	July 1	5	5%	5 p.c. Deb. .	47—49	40—42	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	..	..
209,984	,,	,,	10	10%	Do. B	223—224	180—184	..
528.500	,,	,,	10	10%	Do. C	220—222		
90,000	10	May 28	9	6/-	South African.	10½—11½	9—10	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord. .	111—113	75—77	76—76½
—	—	—	—	—	Do. Pref. . . .	..	94—96	..
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb. .	72½—74½	55—57	56—56⅜
224,820	,,	Feb. 26	8½	7⅜%	South Shields Con. Stk.	157—159	137—139	..
952,795	,,	,,	6	4⅜%	S'th Suburb'n Ord. 5 p.c.	114—116	75—77	76½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref. . .	110—112	75—77	76½—76½
135,000	—	—	—	4⅝%	Do. West Kent . .	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	86—88	86⅜
647,740	,,	May 14	5	5%	Southampton Ord. . .	99—102	75—77	..
120,000	,,	Feb. 12	7½	5½%	Tottenham A 5 p.c. .	135—138	92—97	..
782,275	,,	,,	6	4⅝%	District B 3½ p.c. .	115—117	70—72	71½
181,255	,,	June 26	4	4%	4 p.c. Deb.	87—89	63—65	..
182.380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max..	108½—109½	89—91	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅜	72/6	Wandsworth A 5 p.c..	151—156	112—117	..
255.688	,,	,,	6½	57/6	Do. B 3½ p.c. .	129—134	97—99	..
108,075	,,	,,	5/17/3	50/9	Do. C 3½ p.c. .	110—115	84—89	..
352,900	,,	,,	6½	51/3	Wimbledon 5 p.c. . .	117—122	85—90	..
98,000	,,	,,	6½	57/6	Epsom 5 p.c. . . .	121—126	93—98	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk. . .	66—69	50—53	..

* Ex Div.

Chapel Whaley and District Gas Company.—The report submitted at the eighth ordinary meeting of the Company on the 27th ult. stated that the revenue account for the year ended Sept. 30 showed a profit of £2225; and altogether there was a sum at disposal of £2858, out of which a dividend was recommended at the rate of 5 p.ct. per annum, less tax. This leaves a balance to carry forward of £1173.

Gas Supply of Colwall.—Being placed in a difficulty through the joining-up of their employees, the Colwall Gas Company applied to the Malvern Urban District Council for a supply of gas in bulk. The Council have agreed to a recommendation by the Gas Committee that such a supply be given to the Company, at 3s. 9d. per 1000 c.ft., rising or falling 1d. for every 1s. variation in the price of coal, taking the Council's present average price of 27s. 3d. per ton as the basis. The daily maximum supply is not to exceed 12,000 c.ft.; and the Company are to authorize the transfer under their contracts of coal of approved quality equivalent to the amount of gas supplied.

The Lisburn Urban Council have granted a bonus of 6s. per week to employees in the Gas Department.

The York City Council have decided that six months' notice be given to the Gas Company to abate the nuisance from smoke, &c., at their works at Monk Bridge.

Owing to increasing costs, the Malvern Urban District Council have, to prevent a deficit on the working of the gas undertaking, decided to increase the present price of gas of 3s. 9d. per 1000 c.ft. by 5d., subject to a discount of 5 p.ct. for prompt payment.

At a meeting of parties interested in the scrap-metal trade, called at the instance of the Ministry of Munitions, and held in Dundee, it was pointed out that the Government restrictions on the use of oxy-acetylene for metal-cutting purposes was proving a hindrance to supplies reaching the market quickly; and Mr. Alex. Yuill (the Corporation Gas Engineer) stated that he had successfully experimented with oxygen and coal gas for this purpose. With suitable burners, this could be used for any thickness of metal.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral Countries unless they are posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

POWER SUPERINTENDENT. Saltley Gas-Works.
SECOND ASSISTANT. Warrington Gas Department. Applications by Dec. 15.
LEADING DRAUGHTSMAN. No. 6387.
RENTAL CLERK. Swindon Gas Company.
LEADING STOKER. No. 6386.
ATTENDANT (Male or Female). No. 6390.
STOKERS. Nixon's Navigation Offices, Mountain Ash.

Appointments, &c., Wanted.

MANAGER OR WORKING MANAGER. Manager, Holborn Gas-Works, Mitcham, Surrey.
WORKS MANAGER. No. 6389.

Plant, &c. (Second-Hand) for Sale.

DRY METER (600 LIGHT). Irvine Gas Company. Tenders by Dec. 15.

Plant, &c. (Second-Hand) for Sale *(continued)*—

MOUTHPIECES, ASCENSION, ARCH, AND DIP PIPES HYDRAULIC MAIN, RETORT-HOUSE GOVERNOR Southampton Gas-Works.

TENDERS FOR

Tar and Liquor.

GAINSBOROUGH GAS DEPARTMENT. Tenders by Dec. 17.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

"VOLCANIC" FIRE CEMENT.
Resists 4,500° Fahr. Best for Gas-Works.
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STREET LAMPS AND AUTOMATIC CONTROLLERS.
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REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
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"BRADDOCK, OLDHAM," and "METRIQUE, LAMB LONDON."

BENZOL PLANTS FOR GAS-WORKS.

BAGLEY, MILLS, & Co., Ltd.,
92, Victoria Street, Westminster, S.W., invite inquiries from all gas-works making 75 million cubic feet and upwards per annum.
See illustrated Advertisement Feb. 20, p. III. of Centre.

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(ESTABLISHED 1753.)
SLOT AND ORDINARY DRY METERS.
EXTENSIVE RANGE OF USEFUL GAS WORKS' ACCESSORIES.
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Tins for sale to Consumers.
In Bulk for Works Use.

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GAS METERS (Ordinary and Prepayment),
"FALCON" INVERTED LAMPS and SQUARE LANTERNS for Street Lighting,
INVERTED BURNERS and CONVERSION SETS for Street Lamps.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Nov. 27, p. 427.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, ROSE MOUNT IRONWORKS, ELLAND.

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Telegrams: "Bripurimat, Wood, London."
'Phone: Palmer's Green 608.

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SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
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Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—1588 AVENUE (3 lines).

SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—
BALE AND HARDY,
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70, Chancery Lane, London.
Telegrams: "Patent London." 'Phone: 248 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams—"SATURATORS BOLTON." Telephone 0848.

ENQUIRIES SOLICITED.
FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 60 years. Reference given to Gas Companies.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

POSITION required as Manager or WORKING MANAGER in Small Works (8 to 20 Millions). Thorough Practical Knowledge in Manufacture and Distribution of Gas; also the Manufacture of Sulphate of Ammonia. Erection and Repairs to Plant. (South of England preferred).
Address the MANAGER, Holborn Gas-Works, Bond Road, MITCHAM (Surrey).

WORKS Manager of a Gas Company (Output 60 Million c.ft.) with Charge of Distribution, SEEKS CHANGE. Age 41. Seventeen Years' Experience. Good Business Abilities, Engineering Knowledge, and Excellent References.
Address No. 6389, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

WANTED—Leading Stoker accustomed to Exhausters and Boilers. Wages, £3 7s. 6d. per Week for Seven Eight-hour Shifts.
Apply, by letter, to No. 6386, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

SWINDON UNITED GAS COMPANY.
WANTED—A Rental Clerk (Ineligible for Service).
Apply, stating Age, Experience, Salary required, References, &c., to the SECRETARY, Gas Offices, Queen Street, SWINDON.

LEADING Draughtsman for Structural and General Engineering Works.
Apply, by letter, stating Age, Experience, and Salary required (Manchester District,), to No. 6387, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

POWER Superintendent required, to be responsible for the Economical Working of Nine Boilers and for the Efficiency of all Steam and Gas Engines on the Works. Commencing Salary, £200 per Annum.
Applications, giving Age, Experience, with *copies* of recent Testimonials, to the ENGINEER, Gas-Works, Saltley, BIRMINGHAM.

WANTED, immediately, for a Provincial Gas Company, a Competent ATTENDANT (male or female).
Write, giving References, Age, Experience, and Salary required, to No. 6390, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

WANTED—a Second Assistant, who would be able to Take Entire Charge of the Works and Capable of Performing all the usual Gas-Works Tests.
Applicants to state Age, whether Married or Single, and give Particulars of Experience and *copies* of recent Testimonials. Salary, £175.
Applications to be addressed to the CHAIRMAN, and received not later than Dec. 15. Warrington Corporation Gas Department, Mersey Street, WARRINGTON.

WANTED—two Reliable Men above Military Age (or Ineligible for Military Service) as GAS STOKERS. Must be good Shovel Charger and understand Regenerator Furnaces, Engine, and Exhauster.
Apply stating Age, Experience, and Wages required, to Mr. W. MILLAR, Nixon's Navigation Offices, MOUNTAIN ASH.

WANTED. — Offers of Pitch, from Makers only, for Prompt and Forward Delivery, stating Price and Quantity.
Address, No. 6388, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

IRVINE GAS COMPANY.
FOR SALE.—One 600 Light Tin Case DRY METER (W. & B. Cowan Makers). New in 1914, and in Good Order.
Offers should be addressed to the undersigned, and be lodged not later than Dec. 15.
H. G. RITCHIE, Manager.
Gas-Works, Irvine,
Dec 6, 1917.

GAS PLANT for Sale.—We can always offer New and Second-Hand Gas Apparatus, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND CO., LTD., CHURCH FENTON, near LEEDS.

THE Southampton Gas Light and Coke Company have the following RETORT-HOUSE FITTINGS for DISPOSAL:
56 16 in. Diameter Circular Tangye MOUTHPIECES, Holman's Cross Bars and Self-Seating Lids.
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One 10 in. New RETORT-HOUSE GOVERNOR, with Inlet, Outlet, and Bye-Pass Valves.
Offers to F. DURKIN, Gas-Works, SOUTHAMPTON.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)
TENDERS FOR TAR AND AMMONIACAL LIQUOR.
THE Gas Committee of the above Council invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR produced at their works for a period of Six and Twelve Months from the 1st of January, 1918.
The Tar and Ammoniacal Liquor will be Delivered into Contractor's Tank Barrels at the Works.
Further Particulars may be obtained on Application to the undersigned.
Sealed Tenders, endorsed "Tender for Tar or Ammoniacal Liquor," addressed to the Chairman of the Gas Committee, must be Delivered at the Gas-Works, Gainsborough, not later than the 17th of December, 1917.
The Committee do not bind themselves to accept the highest or any Tender.
JOHN BALDWIN, Engineer and Manager.
Gas-Works, Gainsborough,
Dec. 4, 1917.

HORNSEY GAS COMPANY.
NOTICE is Hereby Given that the TRANSFER BOOKS of this Company, RELATING TO DEBENTURE STOCK ONLY, WILL BE CLOSED on the 17th inst., and RE-OPENED on the 1st of January, 1918.
By order of the Board,
WILLIAM E. ROBERTS, Secretary.
Secretary's Office, Gas-Works,
Hornsey, N. 8, Dec. 9, 1917.

BARNET DISTRICT GAS AND WATER COMPANY.
NOTICE is Hereby Given that the TRANSFER BOOKS of this Company, RELATING TO DEBENTURE STOCK ONLY, WILL BE CLOSED on the 24th of December, 1917, and RE-OPENED on the 1st of January, 1918.
By order of the Board,
ERNEST W. DREW, Secretary.
139, Cannon Street, E.C.,
Dec. 5, 1917.

RIDDINGS DISTRICT GAS COMPANY.
NOTICE is Hereby Given that the TRANSFER BOOKS of this Company, RELATING TO DEBENTURE STOCK ONLY, WILL BE CLOSED on the 24th of December, 1917, and RE-OPENED on the 1st of January, 1918.
By order of the Board,
ERNEST W. DREW, Secretary.
139, Cannon Street, E.C.,
Dec. 5, 1917.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.
MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at THE MART, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS. at 37, WALBROOK, E.C.

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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in price.
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Manufacturers of GAS RETORTS, GLASSHOUSE-FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every Description of FIRE BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
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ORDINARY & PREPAYMENT METERS
REPAIRS AND CONVERSION OF ORDINARY TO PREPAYMENT METERS RECEIVE PROMPT ATTENTION.
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KOPPERS' PATENT
CHAMBER OVENS.
Results obtained which have never been Surpassed by any other System of Carbonization.
Plants at Work and under Construction for the production of **70,000,000** cubic feet of Gas per Day.
See our large Advertisement appearing in alternate issues of the "JOURNAL."
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